The Electrical Industry's Weekly Magazine September 18, 1961

Electrical World

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12th annual electrical industry

FORECAST

. . . page 105

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ALL-ALUMINUM WEDGE CLAMPS

SERIES AA

eliminate bi-metal contact and galvanic corrosion
for stronger, longer lasting service dead-ends

Blackburn Series AA Wedge Clamps are designed and engineered for use with aluminum neutral messengers at service dead-ends.

Construction is heavy-gauge, high strength aluminum alloy. This aluminum-to-aluminum contact eliminates galvanic corrosion between dissimilar metals.

No need to thread the cable through the clamp. Because slider is removable, the clamp can be easily installed anywhere on a continuous run of conductor. Wedging action, as strain is applied to the neutral, grips tightly along the entire length of contact. Re-establishing proper sag is quick and easy.

Two types of bails available for easy installation: flexible strand with nylon jacket or rigid stainless steel, locked to wedge so it won't pop loose.

You can reduce inventory with this versatile series of clamps. Only four sizes will dead-end a range of cables from #6 solid through #4/0 ACSR.

Blackburn Wedge Clamps are also obtainable in chromated aluminum for highly corrosive atmospheres and in stainless steel for copper neutral messengers.

The entire line of Blackburn Wedge Clamps is available from your electrical distributor.

Jasper
BLACKBURN
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1525 Woodson Road • Saint Louis 14, Missouri

Published for 87 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

September 18, 1961
Vol. 156, No. 12

Dateline . . .

IAEA Grows From Infancy to Childhood

Vienna, Austria—The announcement last week that a survey showed that nuclear power would be economically feasible in the Philippines by the late Sixties brought into the news again the once much-heralded but now often-forgotten organization that conducted this particular survey, the International Atomic Energy Agency.

Particularly in the US, the IAEA does not seem to play an important role in the development of the peaceful uses of atomic energy. But in other countries, such as the underdeveloped ones, the IAEA is the vital link with the world of atomic energy.

The Philippine survey is the second one of its type (a similar one was done last year for Finland), and it illustrates the changing role that the four-year-old autonomous agency headquartered here in Vienna is playing in the evolving field of atomic energy.

The original idea for the agency was broached late in 1953 in the famous "Atoms for Peace" speech President Eisenhower delivered before the United Nations General Assembly in New York. While one of the objectives of the proposed agency was to be the application of "atomic energy to the needs of agriculture, medicine, and other peaceful activities," the one that caught the most attention was that of nuclear power development. Eisenhower proposed that a bank of fissionable materials be formed and that the agency serve as a broker, with the nuclear "have" nations supplying the material from out of their own stock piles to the "have not" nations.

Some three years later the new agency was formed and some 5,000 kg of U-235 have now been alloted to the agency by the US, the United Kingdom, and the USSR. Nevertheless, the brokerage idea has never really gotten off the ground. So far, Finland has used a few kilograms for a small research reactor and Yugoslavia is seeking to do the same thing.

But no sizable power reactors have been built using the IAEA allotments, mainly because the US and USSR have used bilateral agreements to sell fissionable materials to other countries. As a result, critics of the IAEA are quick to point out that the agency has not been all that it should have been.

(*Continued on page 5*)

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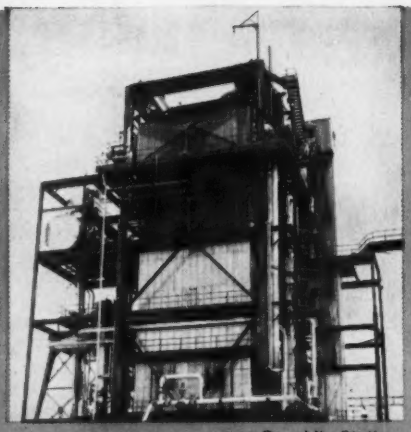

Coughlin Station

In 1948, Midwest fabricated and erected the piping for Central Louisiana Electric Company's Coughlin Station, Units 1 and 2. Total capacity for both units was 7,500 KW, operation conditions 625 pounds @ 825°.

Midwest continued to furnish piping for the station's four subsequent expansions, including a 100,000 KW unit in 1961, and for the first two units of the company's Teche station. Combined capacity of all units piped by Midwest was 270,000 KW.

Midwest's proven capabilities for quality fabrication and erection have resulted in "repeat business" like this from many major power companies.

The story of Midwest's coordinated fabrication-erection service is told in a 24-page illustrated brochure, POWER AND PROCESS PIPING. Write for your free copy today.

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Teche Station

Electrical World

Dateline . . .

Vienna Austria (*Continued from page* 3)

But staffers inside the agency disagree and say that this phase of the agency's operations will grow in time as more and more countries develop the manpower and know-how to operate nuclear facilities.

In the meantime, the IAEA has been content to adapt its program to the needs of the 76 member countries. Thus, for the underveloped countries, the need has been for basic training in nuclear matters, from isotope use to uranium mining, and in this respect the IAEA has served as a teacher, librarian, and consultant, passing on information the "have" nations have acquired.

At the same time, for the advanced nations, the IAEA has served as a clearing house for information. As an example, last week in Salzburg, the IAEA held a technical conference on nuclear fusion.

In addition, the IAEA is providing other useful services for the advanced nations, such as trying to work out international safety and legal regulations.

In all, the IAEA says it has seven functions: (1) nuclear energy research, development, and application; (2) services, equipment, and supplies; (3) scientific information; (4) exchange and training; (5) safeguarding of IAEA-assisted projects against use for military purposes; (6) safety; and (7) facilities.

Different countries are interested in different functions, and as time goes on these different functions receive varying emphasis. For instance, the safeguarding against military uses has not been a very important issue without the sizeable use of IAEA fissionable material. But a first step along this road was made last month when the US government offered four of its reactor facilities (including the 11-Mw Piqua, Ohio, power reactor) as "guinea pigs" in proving the adequacy of IAEA safeguards.

The Philippine and Finland nuclear power feasibility studies are thus another change in the activities of the IAEA as it grows from infancy to childhood.

Letters

Study on Giant Power Was Released

To the Editor:

In the article "Giant Federal Power Whispered" in the August 21 issue of *Electrical World*, it is stated, "However, there is every indication that the Administration did have a general fairly detailed plan of development. Some of this plan is based on an unreleased 1952 Interior Department document prepared by the Bureau of Reclamation and titled 'A Study of Future Power Transmission for the West.'"

The term "unreleased Department document" is incorrect. Approximately 5,000 copies of this booklet were widely distributed throughout the country after release in early 1953, and the study was made available to anyone interested as long as the supply lasted. Copies were sent to most of the libraries in the country, to many magazines, particularly those concerned with electrical power such as *Electrical World*, and to many interested agencies and persons both governmental and non-governmental. *Electrical World* reviewed this document at some length in an issue of the magazine (EW, Jan. 19, 1952, p 22).

The study was made under the direction of H. F. McPhail who was then Assistant Commissioner of the Bureau of Reclamation. He assigned to me the detailed preparation, and considerable effort and many man hours were devoted to the task. I had the assistance of several engineers from the Chief Engineer's office, and many authoritative sources were consulted and drawn upon.

Our interest in this matter dated back many years. There was a much earlier somewhat similar study entitled "Atlas of USA Electric Power Industry Outlining Regional Electric Power Districts and Proposed Constant Potential Transmission Systems for the United States of North America" by Frank G. Baum, which was published in 1923 by McGraw-Hill. This earlier study was, of course, completely out of date, but it was most interesting as an early serious effort to visualize future comprehensive integrated or interconnected electric power system or systems covering the whole country.

The 1952 Bureau study was limited to the Western states since this was the field of operation of the Bureau and it was prepared as a Bureau document. However,

(*Continued on page* 174)

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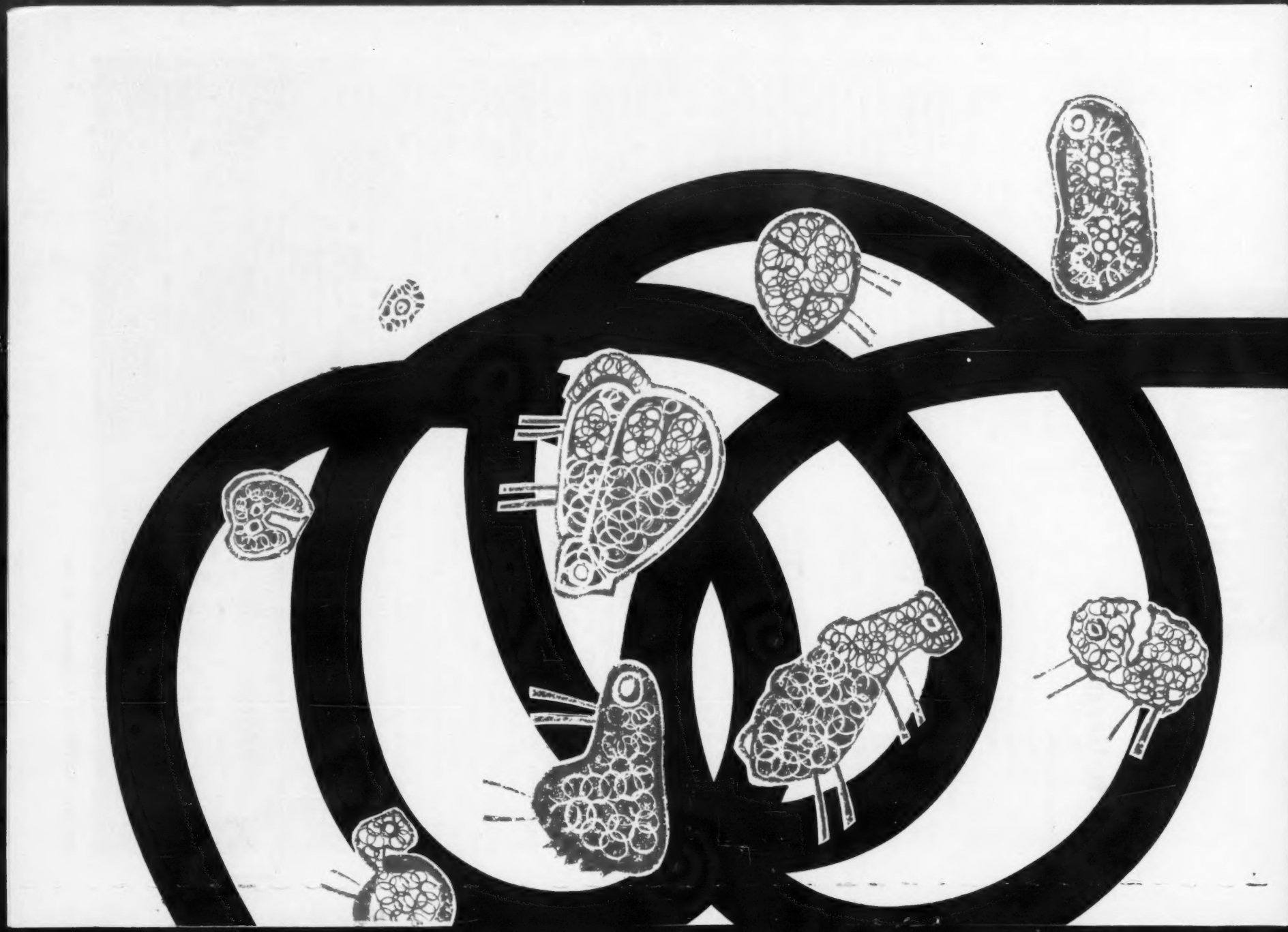

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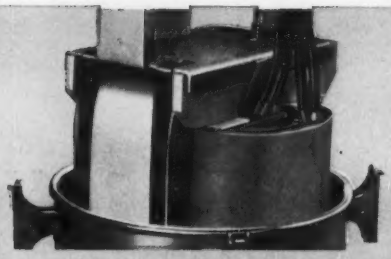

LONGER LIFE, greater short circuit capability. Special coated SPI-65* insulation with improved thermal aging characteristics lengthens transformer life and provides a mechanically stronger coil.

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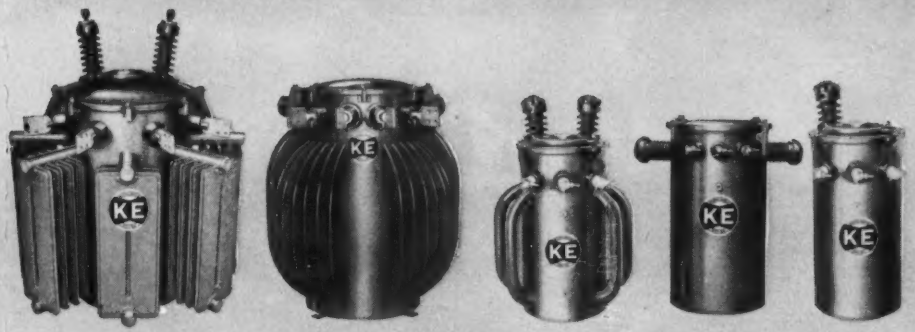
DOUBLE PROTECTION

against wildlife. "Quick-Grip" HV bushing terminals and celuclad covers, exclusive with Kuhlman, insulate all live parts against outages caused by birds and animals. Line connections are simpler, faster, and require no tools.



All new 500 KVA | Light weight 167 KVA | Compact 25 KVA | Two bushing conventional | One bushing conventional

ALL RATINGS POLE MOUNTED

through 500 KVA. New Kuhlman light weight designs, with more compact core and coil, are up to 50% lighter and 40% smaller than previously. Losses are 25 to 30% lower.

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stays brighter longer! New 4-step finishing system for all Kuhlman transformers includes: (1) thorough cleaning, (2) corrosion resistant primer, (3) bonding sealer, (4) DuPont Lucite Acrylic Lacquer.

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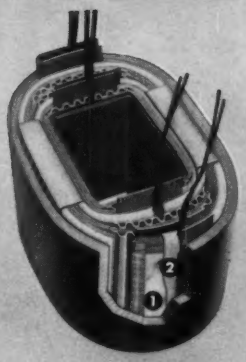
in new Kuhlman transformers! (1) Equalizing shield protects against sudden surges. (2) Special insulation provides more compactness with a higher margin of safety.



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Manufacturers of transformers since 1894

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Any 6M Strand will

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TIME BRINGS OUT THE DIFFERENCE

RUSTABLE STRAND GETS WEAKER— ALUMOWELD STRAND KEEPS ITS STRENGTH

When you buy strand you want the strength you specify—and you want that strength to last. So why waste good money on ordinary strand that can't resist corrosion—that starts to rust away and weaken *after* you install it. Unlike rustable strand, Alumoweld's initial strength remains permanent year after year.

With its *thick* covering of aluminum—25% by area—permanently welded to a strong steel core, Alumoweld gives you the same high resistance to corrosion as solid aluminum. It's made by the exclusive atomic-welding process in which the ductile weld remains permanent under all operating conditions. Corrosive elements can't reach the steel core because of the durable protection of the *thick* aluminum covering.

Diameter for diameter, Alumoweld Strand has the same strength as extra-high-tensile steel—yet, it weighs less and is easier to install. Its initial cost is surprisingly low. In fact, because it will stay up far longer, Alumoweld Strand will actually *cost less* as the years go by.

Alumoweld Strand gives you performance where it counts—on the job! Send for Engineering Bulletin E. D. 3000 and get the full story on Alumoweld's important, money-saving advantages. You'll see why Alumoweld Strand is preferred by so many efficiency-minded, cost-conscious companies.

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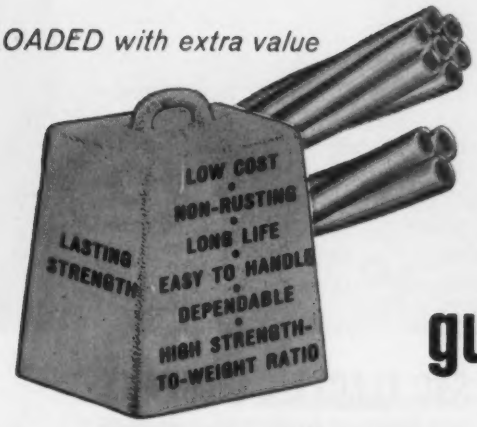


ALUMOWELD®

guy and messenger strand

Switch & protect residential underground circuits . . . in air

The pad mounted transformer illustrated above features easy access to both primary and secondary connections. The transformer manufacturer has used an S&C pad mounted fused disconnect on the incoming side. The hinge of the primary fuse, visible between the two barriers, mounts directly on the side bushing of the transformer. Flanking the fuse are two disconnects, permitting the transformer to be isolated without disturbing the incoming cable connections.

S&C's new pad mounted gear employs fuses and disconnects expressly designed for compact air-filled enclosures

The simplicity and practicality of overhead distribution practices are now available on residential underground circuits. "Air-filled" S&C pad mounted gear switches, protects and isolates pad mounted transformers and buried cables. It provides all these advantages, too:

1. Full load switching and fault interruption are *outside the transformer*. No arcs are drawn under oil to cause fires, "burping," contamination. External switching also means *visible air gaps*.
2. Fuse eliminates need for primary link inside transformer. Transformers needn't be untanked for re-fusing.
3. Wide choice of fuse ratings (up to 200E amperes continuous) permits close coordination, anticipates load growth.
4. Both transformers and cables can be switched. This applies to load currents, charging currents, and magnetizing currents.
5. Eliminates the hybrid combination of overhead sectionalizing with pad mounted transformers—puts your residential distribution system entirely underground.

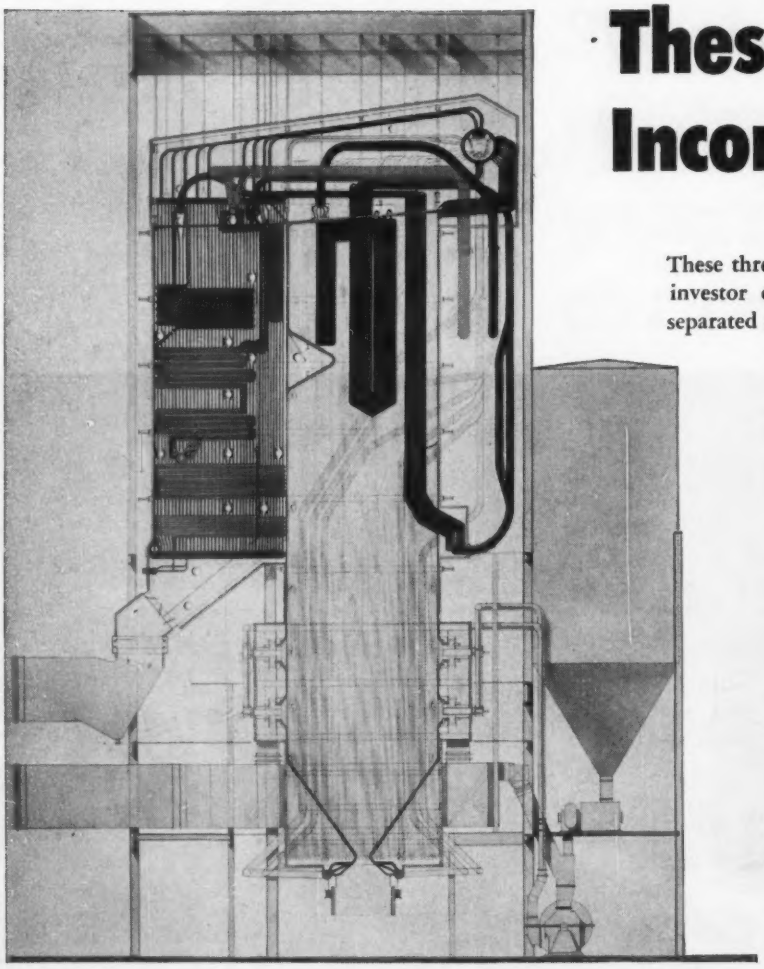
You can order S&C pad mounted gear in almost any disconnect and fuse arrangement for sectionalizing . . . or components for transformer primary applications.

The fused disconnect above is S&C's Standard Duty Style; the disconnects are rated 200 amperes continuous (8,000 amperes momentary); the fuse is rated up to 50 amperes continuous, 8,000 amperes interrupting. With Loadbuster, the disconnects and the fuse can switch full load.

S&C ELECTRIC COMPANY
4421 Ravenswood Avenue • Chicago 40, Illinois
Specialists in High Voltage Circuit Interruption since 1911

S&C Heavy Duty Pad Mounted Fused Switching Unit shown above is a complete, free-standing device—functioning, in this case, as loop tap serving adjacent pad mounted transformer. Disconnects are rated 600 amperes continuous (25,000 amperes momentary). Power fuse is rated up to 200 amperes continuous, and 17,500 amperes interrupting.

Note how visible circuitry reduces chance of operator error. With Loadbuster, S&C's portable loadbreak tool, the operator can switch full loads—up to 400 amperes at 14.4 kv.



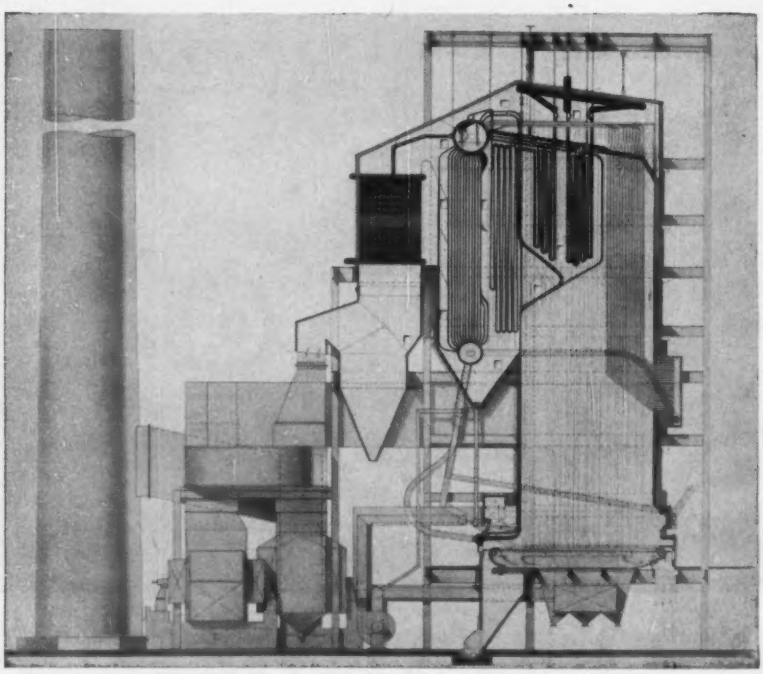
These RILEY Incorporate The

These three Riley boilers are being built for three investor owned electric utilities in three widely separated sections of the country. Featured in these designs are some of the most recent Riley engineering developments, such as the Riley *Turbo Furnace,* new superheater and reheater arrangements, new high capacity steam washer, use of radiant superheater platens, multiple downcomers for uniform distribution of feedwater, opposed wall firing, new '60 type Riley Flare Type Burners and Pulverizers, and the world's largest spreader stoker.

Left —

For A Central Station — Southeast

This dry bottom balanced draft pulverized coal fired unit is a 1,700,000 lbs/hr unit, 2525 psi at superheater outlet, 1005F superheat and 1005F reheat. The unit is fired by five No. 550E Riley Pulverizers and twenty Riley Flare Type Burners with two rows of five burners in the front and rear walls. This boiler will be completely automated.



Opposite Page —

For A Central Station — Southwest

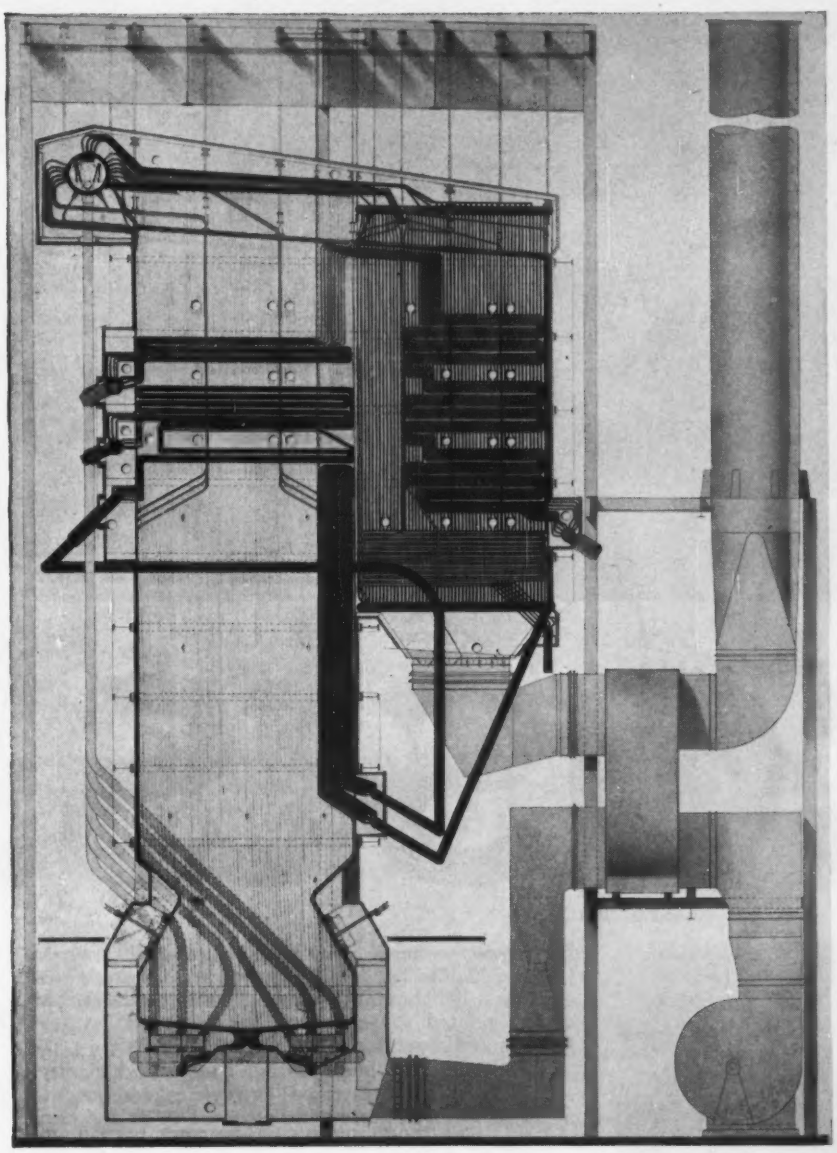
This is a gas fired Turbo Furnace Unit having a normal capacity of 2,486,000 lbs/hr, 2425 psi, and a peak capacity of 2,668,000 lbs/hr at 2590 psi superheater outlet pressure, 1005F superheat and 1005F reheat. It is designed for pressurized operation without induced draft fans, and for future pulverized coal firing with merely the addition of water tube platens.

Left —

For A Central Station — Northwest

This unit will be by far the largest spreader stoker fired lignite burning boiler. The Riley Traveling Grate Spreader Stoker is 38′-0″ wide by 27′-0″ shaft centers. The boiler is designed for a continuous capacity of 650,000 lbs/hr, 1300 psi, superheater outlet 955F, and a peak capacity of 685,000 lbs/hr. It will burn 6680 Btu. North Dakota lignite. Among the reasons for selection of spreader stoker firing of lignite were the large savings in power and maintenance over pulverized coal firing.

Central Station Boiler Designs Latest Riley Engineering Features



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*Have placed repeat orders.

A careful survey of your plant by a qualified consulting engineer could show ways of making substantial savings in power costs.

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Let's talk costs!

150,000-kva, 230-kv Pennsylvania LTC Transformer, enroute from railroad siding to installation site.

By "costs" we mean more than the original purchase price—which is but one of several important considerations when buying equipment as intricate and as closely related to service reliability as LTC transformers and regulators.

Such equipment involves high-speed moving parts . . . precise mechanical as well as electrical components . . . rugged insulation requirements. Design and construction, therefore, can make a real difference in long-term operating efficiency and maintenance. In some cases, installation costs also can be a factor.

Pennsylvania Transformer welcomes a comparison on all of these important points.

Pennsylvania Cuts NO Corners in Material, Workmanship or Design

From the smallest Pole Star Regulator to LTC transformers as large as 300,000 kva, Pennsylvania takes no calculated risks in material or design, cuts no corners in production or testing. Here are just a few

Over the long haul . . . are you getting maximum value for your LTC purchasing dollar?

of the reasons you can be certain of maximum value when you purchase Pennsylvania LTC equipment:

- Test- and service-proved design principles are adapted to the specific requirements of each kva and voltage range. Result: optimum switching speeds, with minimum arcing and contact wear . . . uniformity of speed and positioning over many years.
- Pennsylvania innovations—such as the Phase-Isolated Transformer and isolating by-pass—provide new opportunities for improving electrical service while reducing installation and maintenance costs.
- One-piece, upright shipment of even the largest LTC transformers cuts installation time and costs.
- Switch contacts are of forged copper, with sintered metal inserts where needed to resist arc erosion.
- To secure optimum dielectric-stress control, mounting panels are made of Pennsylite (a low-loss, low-power-factor laminate developed expressly for Pennsylvania), with live rounded parts raised on spacer insulators.
- All LTC components and assemblies are scientifically checked, using precision quality-control tools and requiring on-the-record responsibility at every step.
- Each LTC assembly undergoes a "break-in" test run—as many as 5000 tap changes for larger units, followed by torque tests and inspection.

These and other advantages may not always add up to the lowest original purchase price—but if you are looking for *maximum value* in LTC equipment, it will pay you to investigate Pennsylvania. For a consultation on present needs, or a copy of *Bulletin 81*, contact Pennsylvania Transformer Division, McGraw-Edison Company, Box 330, Canonsburg, Pa.

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PENNSYLVANIA LTC TRANSFORMERS

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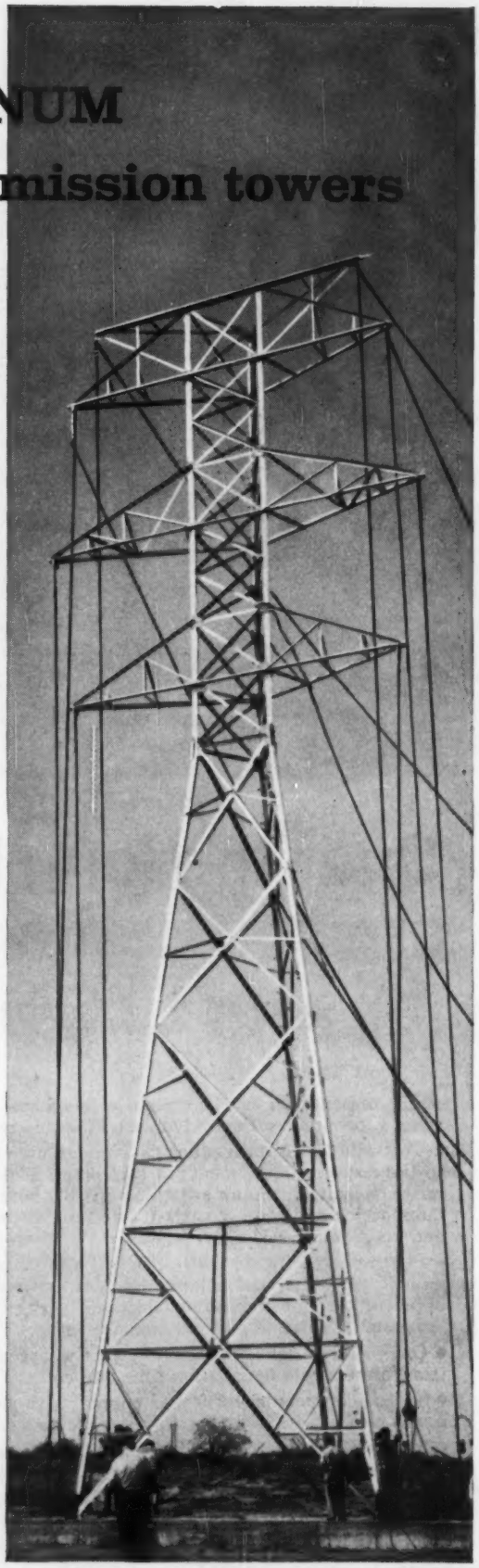
"custom tailors" transmission towers

to cut your costs



At Phoenix, Arizona, Reynolds Structural Fabricating Division is designing, fabricating and assembling new aluminum towers. Because aluminum is light in weight, fabrication and assembly are simplified. Because aluminum combines strength with light weight, structure weight can be reduced 60 to 70% while retaining load-carrying capacities of structures made of heavier metals. And these lighter weight structures naturally cost less to ship, cost less to erect. (Helicopters can even be used to transport lightweight aluminum structures into otherwise inaccessible areas.)

Towers built of aluminum require only minimum maintenance because aluminum is corrosion resistant and cannot rust, ever. It is an ideal material for structures located in seacoast areas or industrial atmospheres. In contrast to aluminum, periodic protective painting on towers made of other metals can very easily, over a period of years, cost more than the original tower! Also with aluminum, there's no problem of painting "hot" towers or the costly practice of stopping transmission service for maintenance.

Reynolds can offer a complete series of standard aluminum structural shapes or design new shapes to fit your requirements. New types of transmission towers are constantly being designed, fabricated and tested at Reynolds Structural Fabricating Division in Phoenix.

Add up aluminum's advantages in fabrication, assembly, erection and maintenance. The result: transmission towers that will deliver longer service at a lower per year cost. For complete information, call your nearest Reynolds Sales Office or write *Reynolds Metals Company, P. O. Box 2346-EL, Richmond 18, Virginia.*

Watch Reynolds TV Show,
"Harrigan & Son", Fridays—ABC-TV

fold down

...and
take
your
first
look
at
"Tiny Tim"™–
the
world's
smallest
50-KVAR
power
capacitor

50-KVAR "Tiny Tim" case dimensions: 15" high x 4½" wide x 13½" deep. Weight: 62 lbs. 100-KVAR "Tiny Tim" case dimensions: 28¼" high x 4½" wide x 13½" deep. Weight: 115 lbs. Ratings: 2400 through 7960 volts, 60 cycle, single phase, with single or double bushings.

(actual size!)

It's not just the smallest (no bigger than conventional 25-KVAR's) but also the lightest: 62 pounds. We also have a 100-KVAR that meets NEMA standard mounting dimensions for 50's. Savings to you are obvious: in sub-stations, on poles—in utility and distribution systems. Along with these savings, you still get the famous Cornell-Dubilier 99.6% trouble-free operating rate. Our Bulletin 8150 explains all. Ask your FPE sales engineer for a copy, or write: Power Factor Capacitor Marketing Dept., Federal Pacific Electric Co., 333 Hamilton Blvd., South Plainfield, N. J.

Unit No. 1 of South Bay Power Plant, newest and largest steam-electric generating unit of the San Diego Gas & Electric Company

THAT SAN DIEGO!

That California! How it grows—nearly three times as fast as the rest of the nation! But that San Diego area has been growing almost twice as fast as the rest of California!

But think of all it has: climate, scenery, tourist attractions, higher education, military installations and industry.

From the big Camp Pendleton Marine Corps Base on the north, this region of dynamic population growth extends along the Pacific to Mexico. Clustered around the City of San Diego are historic missions, Balboa Park's world famous zoo, seven institutions of college learning, and a total of 18 army, navy and air force installations.

Along the power lines of the San Diego Gas & Electric Company are 24 distinct industrial areas. Much of it is airborne enterprise: aircraft and missile. The 329,113 electric customers, both residential and industrial, used 2.6 billion kilowatt-hours during 1960, 11.7 per cent more than the previous year.

To meet the increasing demand for electricity, San Diego Gas & Electric last year put Unit No. 1 of its South Bay Power Plant into operation, raising the system's generating capacity 142,000 kilowatts to a total of 809,000 kilowatts. Unit No. 2, with equal capacity, is scheduled for completion next year.

Because this new and handsome plant is located at the water's edge, it is painted with three shades of metal gray Subox Paints to blend it in with its surroundings. Thus, anti-corrosive Subox gives the plant both protection and decoration. If you're down that way, be sure to look at it. It's worth seeing.

SUBOX PAINTS

Subox Inc.
Trade Mark

Main Office & Plant, 3 Fairmount Park, Hackensack, N. J.
AFFILIATED PLANTS: Canada, Mexico, England, Belgium, Switzerland, Austria, Australia, New Zealand.

Electrical World

SEPTEMBER 18, 1961
Vol. 156, No. 12

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● ELECTRICAL INDUSTRY FORECAST finds sales of electric power growing more than twice as fast as the American economy in general from now until 1980. In the short run, look for the resurgence of industrial activity to set the pace for electrical industry sales. Between 1965 and 1980 total electric living, which is now in its infancy, will reach maturity and spur electric sales to better than 2.9 trillion kwhr, an increase of more than 300% over current levels..... 105

● SMALL LINE CREWS ARE MORE EFFICIENT than eight-man crews. Time studies show that two and three-man crews turn in an additional half hour of production for each man-day. This makes them 15% more efficient.... 102

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NEXT WEEK

DRAWING-BOARD AGILITY: New designs squeeze 115-kv line into 40-ft right-of-way.

The Electrical Week

LATE NEWS ▶ **Showdown between White House and Congress** may be in the making as both Senate Public Works and Interior Committees approve Delaware River Compact without a public preference clause. This means almost certain approval of the compact by the Senate on heels of approval by the House. A Senate-House compromise on other changes would send the bill to Pres Kennedy without a preference, although they won't say whether or not they will ask Pres Kennedy to veto the bill.

Unanimous consent on Senate floor clears way for a study of the nation's fuels and energy requirements by a special subcommittee of the Senate Interior Committee. The study will look into all phases of the nation's energy base: coal, oil, hydroelectric, and nuclear. The subcommittee will also have on it three Senators not now on the Interior Committee, plus outside consultants.

Alcan's aluminum smelter at Kitimat, B. C., is back in operation after an enforced three-month shutdown to permit removal of a rockfall in the ten-mile tunnel conveying water to the powerhouse. Engineers are now satisfied that the tunnel will be able to deliver its full design potential of power.

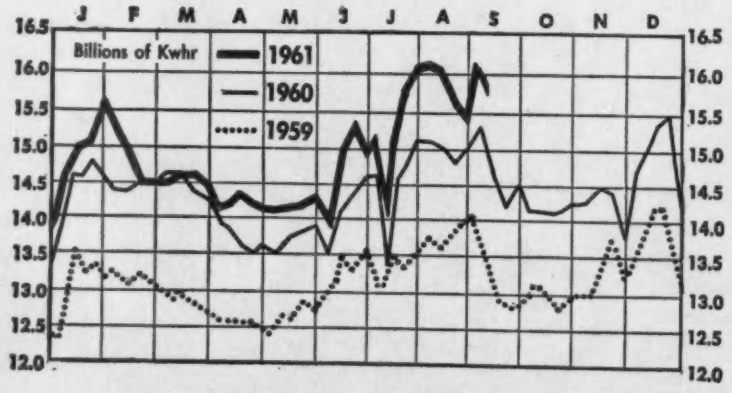
We do not propose to approve any "dual-rate" contracts, REA Administrator Clapp tells an applauding audience at NRECA's Region V meeting. "REA proposes to make G&T loans a readily-available alternative for borrowers" unable to get reasonable and fair power contracts. Speaking of territorial integrity of cooperatives, Clapp says "the only effective answer must come through your state legislatures . . . we hope to propose a basic legislative approach," a model bill which can be adapted to each state. **NRECA general manager Ellis** calls Hells Canyon, Passamaquoddy, the atomic energy program, and Hanford, waste. But, he adds, "there are signs that America is awakening . . . that responsible people are deploring deliberate waste." The present Administration's attention to rural areas development is "perhaps the most significant pattern of hope."

Failure to comply with a management ultimatum results in automatic resignation of 144 striking, non-union line workers of the municipally-owned Memphis Light, Gas & Water Div. Workers turn down 14¢ hourly hike. Line department spokesmen and management continue negotiations. Service is not interrupted.

An exceptionally long, hot and humid spell along the eastern seaboard can take much of the credit for the 8.4% increase in the weekly output figure (below) over the same period last year.

WEEKLY POWER OUTPUT—Up 8.4%

(Week ending Sept. 9), Kwhr 15,838,000,000



Per Cent Change From Previous Year

	Aug. 26	Sept. 2	Sept. 9
Total U.S.	+ 3.1	+ 5.6	+ 8.4
New Eng.	+ 8.4	+ 8.9	+11.1
Mid. Atlan. ...	+ 6.4	+ 9.4	+20.0
Cent. Indust...	− 0.6	+ 3.1	+ 6.5
West Cent.....	− 1.8	+ 4.8	− 0.9
Southeast	+ 3.1	+ 5.9	+ 8.5
South Cent.....	− 2.8	+ 1.7	+ 4.7
Rocky Mount...	+11.0	+ 8.3	+ 4.4
Pacific			
NW	+ 1.6	+ 2.4	+ 3.1
SW	+14.7	+10.2	+ 8.9

Seasonally Adjusted Index 293

Week Ago 296 Year Ago 282

Source: Edison Electric Institute

Supply Lines

PENN PUC WANTS TO INTERVENE IN DAMAGE SUITS

Pennsylvania's Public Utility Commission, in the first action of its kind by a regulatory agency, is seeking to intervene in 16 damage suits filed by Philadelphia Electric Co on behalf of itself and other electric utilities.

Chairman Joseph Sharfsin of the PUC filed the motion in US Eastern District Court where the electric utilities are seeking treble damages for alleged overcharges on electrical equipment bought from manufacturers among 29 convicted of bid rigging and price fixing earlier this year.

Sharfsin told the court that, as the agency "solely charged with, and responsible for" regulation of utility rates and services, it is "imperative in the public interest" for it to be a party at any settlement negotiations, pre-trial conferences or any other proceedings in the suits. He said the proposed intervention is welcomed by Philadelphia Electric.

In the suits, Philadelphia Electric seeks a still unfixed amount of damages based on alleged overcharges in some $68 million of equipment purchases since June 29, 1956. Filing of the suits followed a request by the PUC earlier this year to all power companies for information on whether, and to what extent, the price fixing reflects on service costs, and whether legal action was planned to recover possible losses.

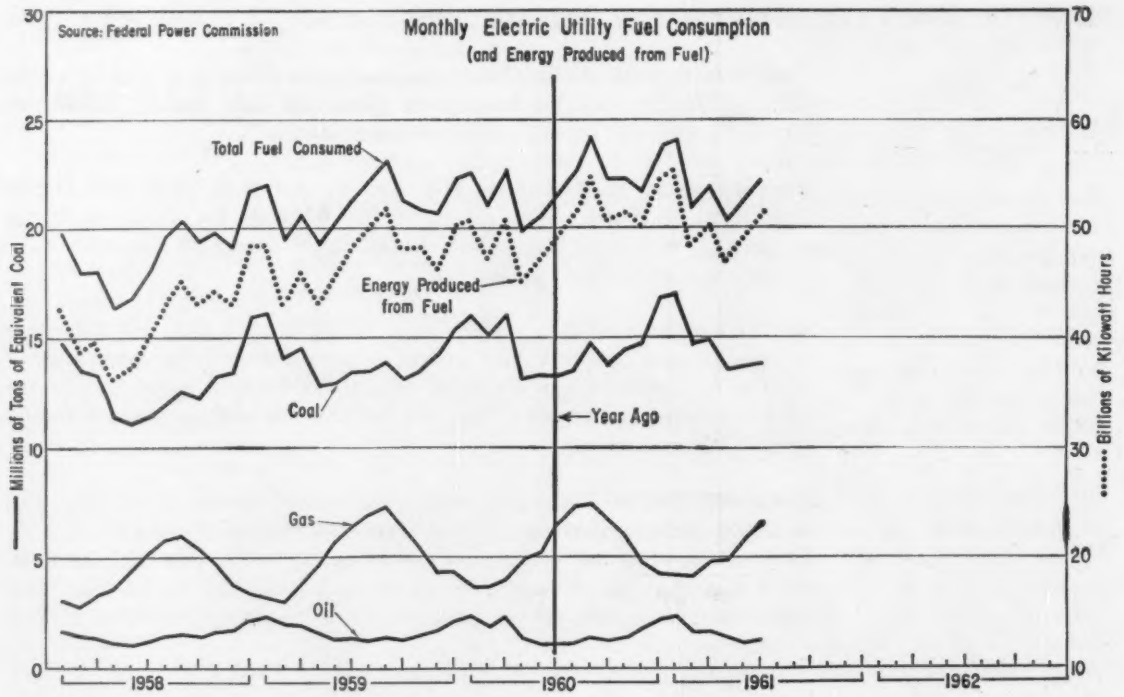
In support of its intervention proposal, the PUC told the court that if electric utilities recover damages, it may have to re-examine "prior or current" rate determinations. Since the utility seeks both overcharge and punitive damages, the PUC said it should be in a position to distinguish, for ultimate rate-making allocations, between the two types of compensation if both are awarded. Without status as a party to the suits, the PUC said it would find it "difficult, if not impossible" to make such analyses, nor could it properly determine whether "both or only one of these elements of recovery" should be considered in determining the benefits, if any, to go to consumers.

SANGAMO WITHDRAWS WATTHOUR METER PRICE RISE

Because competitors announced they will not increase prices on watthour meters, Sangamo Electric Co withdrew a price rise that was to be effective Oct. 1. The company said there had been general customer acceptance of the proposed price change, but the customers also indicated they would not pay a premium for any manufacturer's meter. Sangamo says this attitude is one of the basic reasons for identical prices in the watthour meter industry, and that it also indicates the extremely competitive conditions that presently exist.

ANTITRUST HEARINGS DELAYED UNTIL CONGRESS ADJOURNS

Further hearings by Sen Estes Kefauver's Antitrust & Monopoly Subcommittee on proposed antitrust legislation are delayed until after Congress adjourns. The postponement took place when Republican Senators objected to the subcommittee sitting while the full Senate was in session. There was time, however, to hear Assistant Attorney General Lee Loevinger support four bills and talk against one that would single out price fixing and market division for higher penalties.



FPC REPORTS ON UTILITY FUEL CONSUMPTION IN JUNE

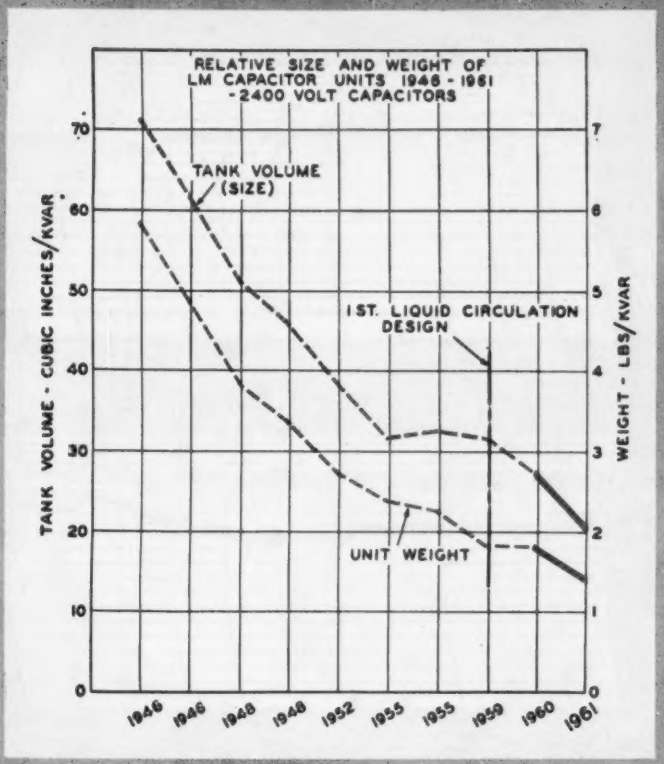
Total fuel consumption by electric utilities in June was 22.33 million equivalent coal tons, an increase of 3.7% over the preceding June compared with an increase of 4.6% in kwhr generation by fossil fuels, the Federal Power Commission reports. (See chart above)

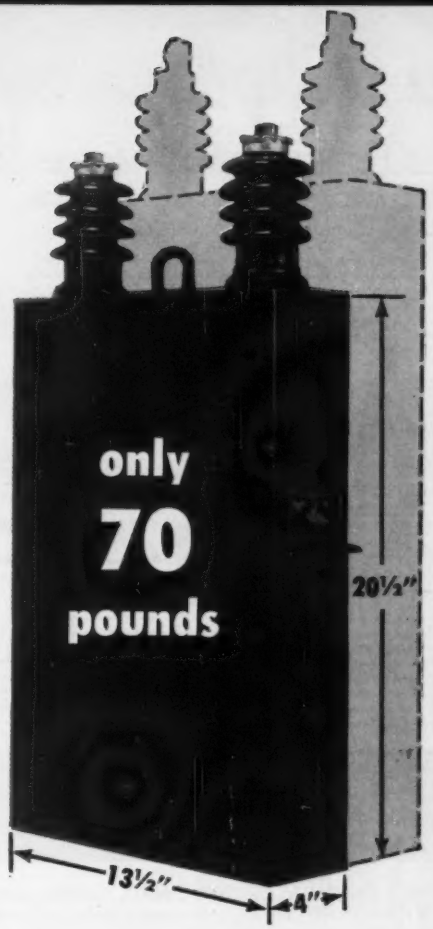
Coal consumption was 13,926,332 tons, an increase of 3.8% over the 13,421,304 tons consumed in June, 1960. Gas consumption was 173,982,353,000 cu ft, an increase of 0.7% over the 172,843,483,000 cu ft burned in June, 1960; oil consumption was 5,764,292 barrels, an increase of 10.0% over the 5,241,317 barrels consumed in June, 1960.

Coal stocks on hand at electric utility plants on July 1 totaled 49.9 million tons, 0.5% below stocks a year ago. This is sufficient to last 108 days, based on the June rate of consumption, compared with 112 days a year earlier. Fuel oil stocks totaled 18.9 million barrels compared to 16.7 million barrels a year ago. This is sufficient to last 98 days, based on the June rate of consumption, compared to 105 days a year ago.

UTILITY CAPITAL SPENDING TO GO UP SHARPLY

The nation's utilities (which includes utilities of all kinds) will be making capital expenditures at the rate of $6.05 billion annually during the fourth quarter, according to new Commerce Department and Security & Exchange Commission figures. This would be an increase of 13% over the first quarter. For 1961 as a whole, however, total investment is expected to be only 1% over 1960's $5.58 billion.





ABOVE GRAPH SHOWS THE STEADY REDUCTION in relative size and weight L-M has made in capacitors throughout the years. A result of L-M's continued research and development programs backed up by expensive test facilities. The latest product, L-M's new Form 6, 50 kvar capacitor, is 17% smaller and 23% lighter. These new capacitors require less space to store, less effort to handle in warehouse and truck. Linemen will find them easier to handle and hoist.

L-M's New Lightweight 50 Kvar Capacitor Assures Ease In Handling and Installation

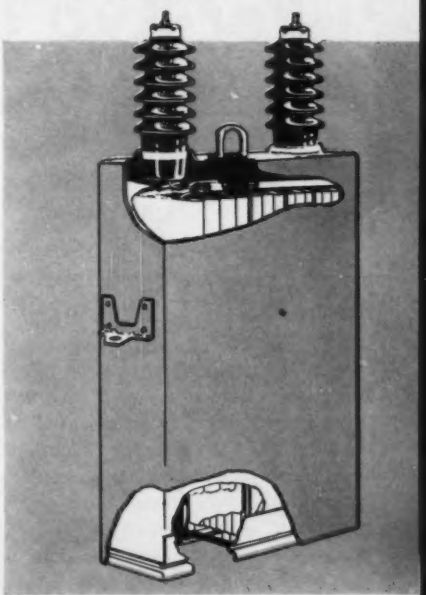
Exclusive cooling methods developed by L-M permit a smaller tank, less Elemex cooling liquid for this lightweight unit.

Line Material announces the new Form 6, 50 kvar capacitor. Another outstanding product of L-M's research and development facilities! This new unit has been greatly reduced in overall size and weight, making it much easier to store, handle, and install.

L-M's exclusive cooling method makes possible this phenomenal reduction in weight and size of Form 6 capacitors. This L-M development permits the circulation of Elemex liquid between and around the packs. Heat generated within the capacitor is carried to the radiating surface of the stainless steel tank. Heat is dissipated more rapidly. The capacitor remains cooler internally even though it is smaller.

Get Complete Information

Have your L-M Field Engineer give you complete details on this new L-M lightweight Form 6, 50 kvar capacitor. Or write Line Material Industries, Milwaukee 1, Wisconsin.



CORRUGATED SPACERS between capacitor packs circulate Elemex liquid eliminating capacitor hot-spots. Heat is quickly transferred to the stainless steel tank walls permitting radiation to surrounding air.

LINE MATERIAL® Industries

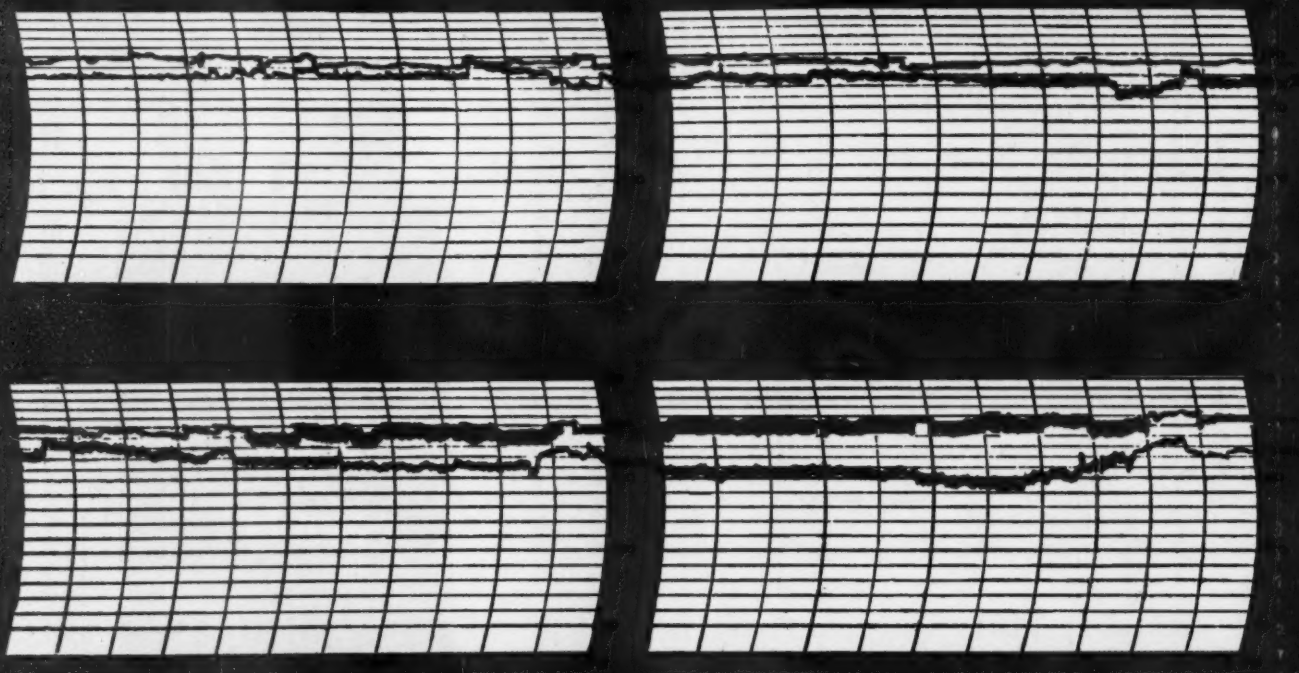
McGRAW-EDISON COMPANY

Elemex® Capacitors

McGRAW EDISON

527

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS
LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS
OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



THESE TYPICAL VOLTMETER CHARTS show what happened when an SRT Transformer replaced a conventional transformer at an industrial load. The black line shows typical voltage variations with the conventional transformer, the blue line, which has been superimposed for comparison, shows the typical voltage with the SRT. Note the former steady voltage drop after 7 A.M., and the way voltage was levelled out by the SRT Transformer. With the conventional transformer, voltage ranged from a low of 108 volts to a high of 120. In comparison, note the uniformity of the voltage with the SRT Transformer. This enabled the utility to realize a substantial increased annual revenue, which much more than covered the added cost of the SRT Transformer.

SRT® Transformers Pay Own Cost With $1 Per Kva Increased Annual Revenue

L-M SRT Transformers provide consistently good voltage at utilization point; maximize revenue.

by **A. R. Waehner**
Director of Transformer Product Sales
Line Material Industries

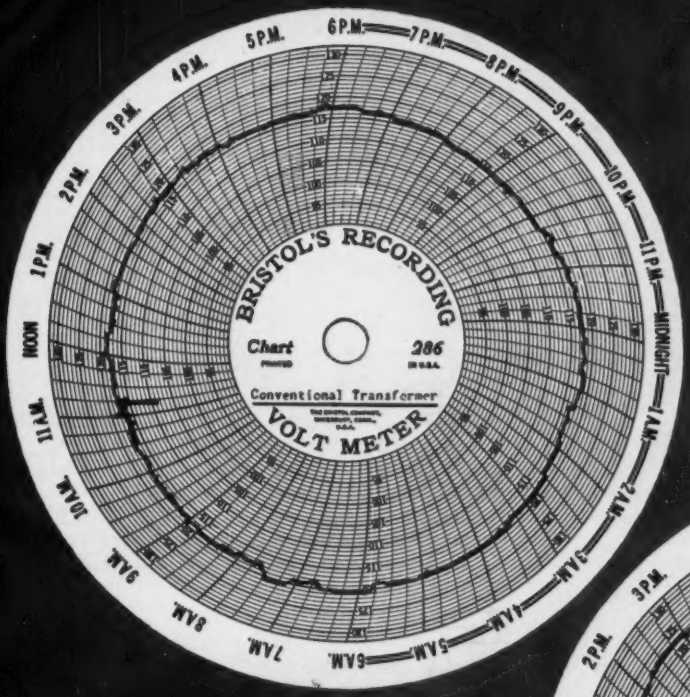
L-M Self-Regulating Transformers provide the ideal way to keep utilization voltage at the optimum level. As load varies, the SRT changes tap positions automatically to assure a regulated secondary output of 123 volts. The electronically controlled self-regulating mechanism assures optimum voltage at all times, with a conservative increase in annual revenue of $1 per kva of nameplate rating. Thus a 25 kva SRT Transformer increases revenue about $25 a year, $50 for a 50 kva, and so on. The increased revenue alone more than covers the cost of the SRT service.

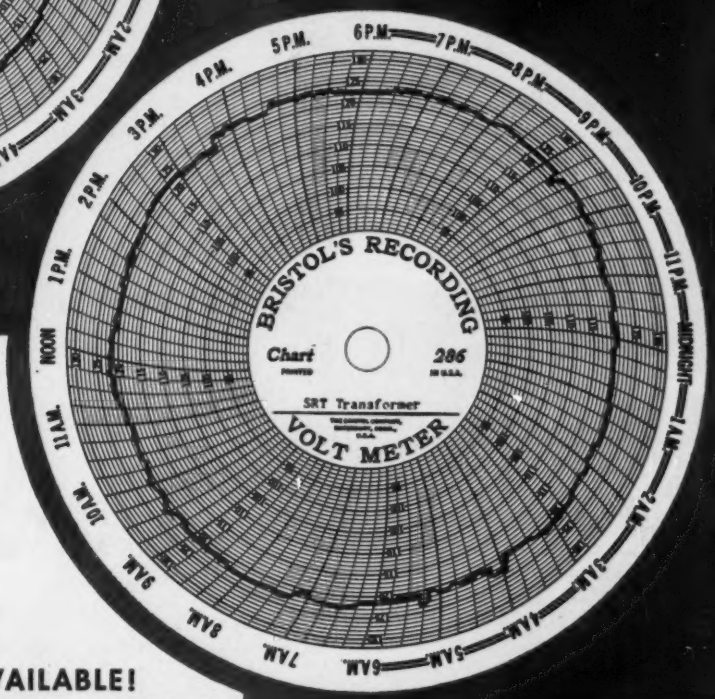
Thus, over and above the customer satisfaction and good will produced by the better service provided, the L-M SRT Transformer pays for itself in actual dollars returned to the utility.

Economic parameters vary in each utility. L-M has programmed its computer to assist you to evaluate the economic benefits of SRT based on your own values. Bulletin No. 61144 (available on request) provides you with an easy means to submit your data. Using your parameters, we will compute the dollar savings SRT Transformers can earn for you.

Dollar savings were calculated on the basis of the following assumptions:

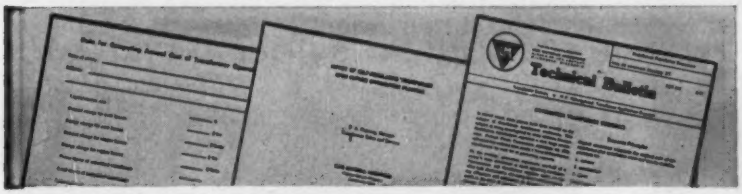
1. **an annual peak load on each self-regulating transformer equal to 150 percent of nameplate kva**
2. **load factor of 35 percent**
3. **power factor of 85 percent**
4. **each two-percent increase in voltage increases kwhr consumption one percent**
5. **each additional kwhr sold increases net revenue one cent**





TYPICAL VOLTAGE CHARTS before, and after, an SRT Transformer was installed at a location serving both commercial and residential customers. Both transformers were 50 kva units. Note that the average voltage was increased. The SRT particularly corrected the typical evening voltage sag from 7 to 10 P.M., when voltage formerly dropped as low as 114 volts. Peak loads were as high as 65 kva on both transformers. The voltage improvement by the SRT Transformer was as much as 12%. This voltage improvement resulted in an average annual revenue increase which more than justified the cost of the SRT Transformer.

NEW SRT BULLETINS NOW AVAILABLE!



Ask your L-M Field Engineer, or write L-M, for copies of these bulletins:

- **No. 61144: Data Form For Computing Annual Savings**
- **No. 61046: Impact of Self-Regulating Transformer on Future Distribution Planning, by D. A. Manning**
- **No. TDT-110: Distribution Transformer Economics, by H. Hollingshead**

Line Material Industries, Milwaukee 1, Wisconsin.

OUR 50th YEAR 1914 LM 1964

LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

Transformers

McGRAW EDISON

'526

DISTRIBUTION TRANSFORMERS · RECLOSERS, SECTIONALIZERS AND OIL SWITCHES
FUSE CUTOUTS AND FUSE LINKS · LIGHTNING ARRESTERS · POWER SWITCHING EQUIPMENT
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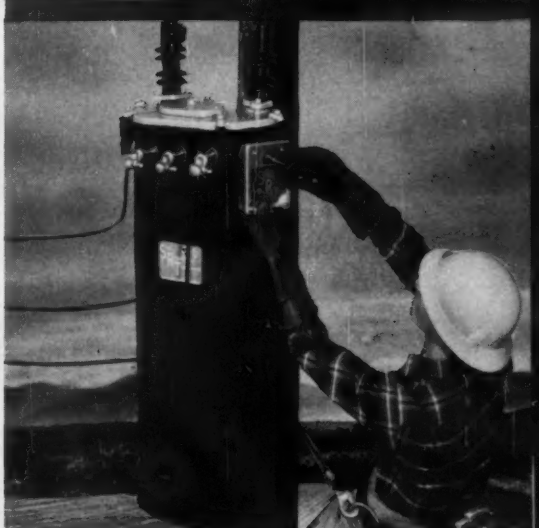
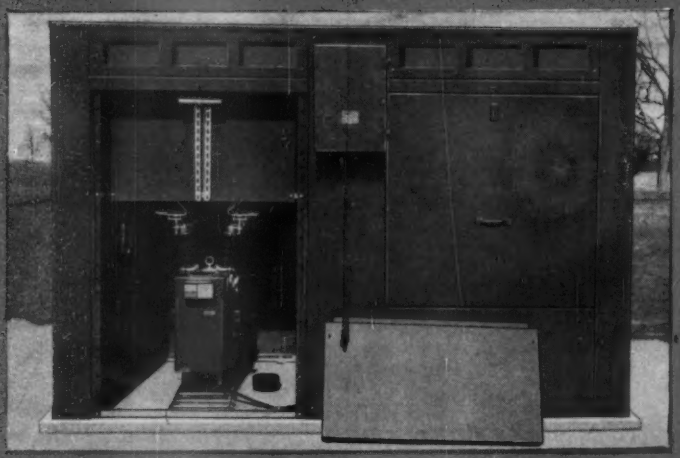
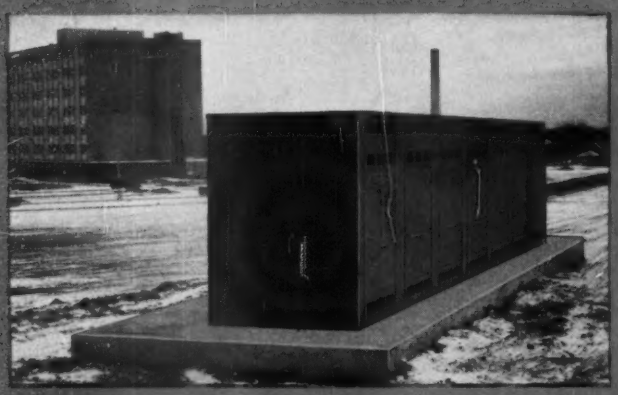


WITH THE NEW ELECTRONIC CONTROL, the SRT Transformer offers even greater flexibility and accuracy. The external control is easily accessible. Band midpoint is accurately adjustable from 120 to 126 volts.

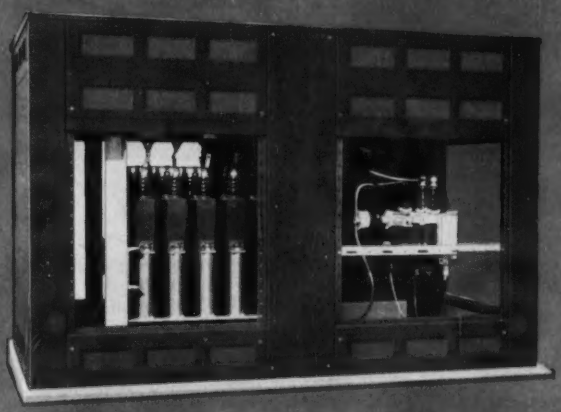


L-M TRANSCLOSURE HOUSING containing load transfer equipment. Switching is performed by two L-M 14.4 kv 400 ampere oil switches. Sensing voltage obtained from two potential transformers mounted in the housing activates the L-M type S control, which in turn opens and closes alternate circuits to assure a continuous flow of power to the load. Each oil switch is equipped with a manual group-operated disconnect switch to permit rapid and safe maintenance. When the manual disconnect switch is in the raised position, the oil switch can be rolled out of the housing for inspection or maintenance.

OVERHEAD RESIDENTIAL DISTRIBUTION was resulting in distortion of radio waves from a U. S. Air Navigation VORTAC facility 2000 feet away (left). It became necessary to install distribution underground. To avoid the high cost of underground vaults and submersible equipment, the utility used L-M Transclosure housings with conventional pole type distribution equipment (right). Results: L-M Transclosures provided an economical solution with better accessibility.



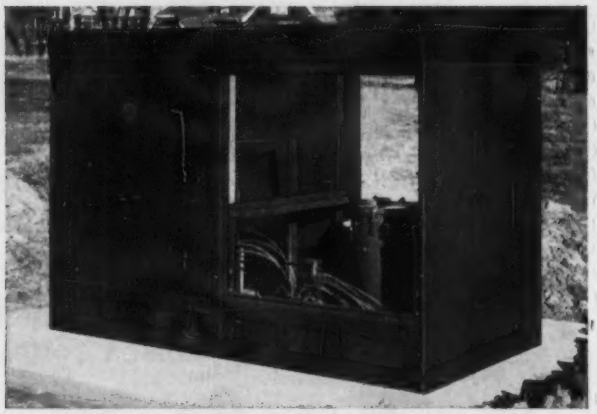
SEVEN L-M TRANSCLOSURE housings are ganged to provide safe protection for street lighting regulating and control equipment at West Allis, Wisconsin. Five regulators plus all controls for five lighting circuits are now housed in this attractive installation. A substantial saving over brick construction was realized.



THESE TRANSCLOSURES HOUSE a pre-fabricated 600 kvar, 3-phase capacitor block. Installation includes controls, switches and bus. Savings of thousands of dollars can be made over conventional housed capacitors.

L-M TRANSCLOSURE HOUSINGS PROVIDE ECONOMICAL 3-HOUR INSTALLATION

HIGHWAY LIGHTING, U. S. 141, WISCONSIN: To house transformer, protective and switching equipment for a 4-way highway intersection, L-M Transclosures were selected. Here they are, as they arrived, in crates. At 12:40 p.m. crew went to work.



3:50 P.M., THREE HOURS LATER. Transclosure frames were bolted to the pad, side panels attached, equipment installed, ready for wiring—all by a crew that had never before seen this equipment. Time was cut substantially as the crew gained experience.

CONTROLS FOR LIGHTING the athletic fields and parking lots at a midwest high school are contained in this Transclosure housing. The double unit shown contains seven L-M type NR oil switches, and high voltage primary terminations and fusing.

L-M's Transclosure™ Housings Economical For All Types Of Distribution Equipment

Modular construction and range of sizes ideal for all types of equipment including transformers, regulators, reclosers, switches, protective equipment, controls, meters, capacitors, load transfer equipment, arresters, buses and insulators.

L-M Transclosures are fabricated steel housings featuring modular design. They can be installed singly or ganged, in a variety of sizes, to house almost any imaginable type of distribution equipment. Additional units may be added at any time.

You have complete flexibility of installation. Transclosures can be installed outdoors at ground level on concrete pads for underground distribution. They are equally versatile on roof tops or indoors. You can install them anywhere. They eliminate the need of expensive vaults or masonry cubicles.

Adequate ventilation is provided for all equipment. Vents at top and bottom have baffles preventing the entrance of all foreign objects, including wildlife. Removable panels can be locked in place to prevent the entrance of all unauthorized personnel.

Get Specifications, Details

Contact your L-M Field Engineer. He's anxious to discuss your enclosure problem with you. Ask him for Bulletins on L-M Transclosure housings. Or write Line Material Industries, Milwaukee 1, Wisconsin

L-M TRANSCLOSURE HOUSINGS at Bartlett Memorial Hospital, Sapulpa, Oklahoma. Three Transclosures are ganged to enclose two 50 kva, one 75 kva distribution transformers, and current transformers. Metering cabinet is shown at end of unit. Complete erection, including assembly and bolting, required only 8 man-hours of labor.

OUR 50TH YEAR 1911 — 1961

LINE MATERIAL® Industries

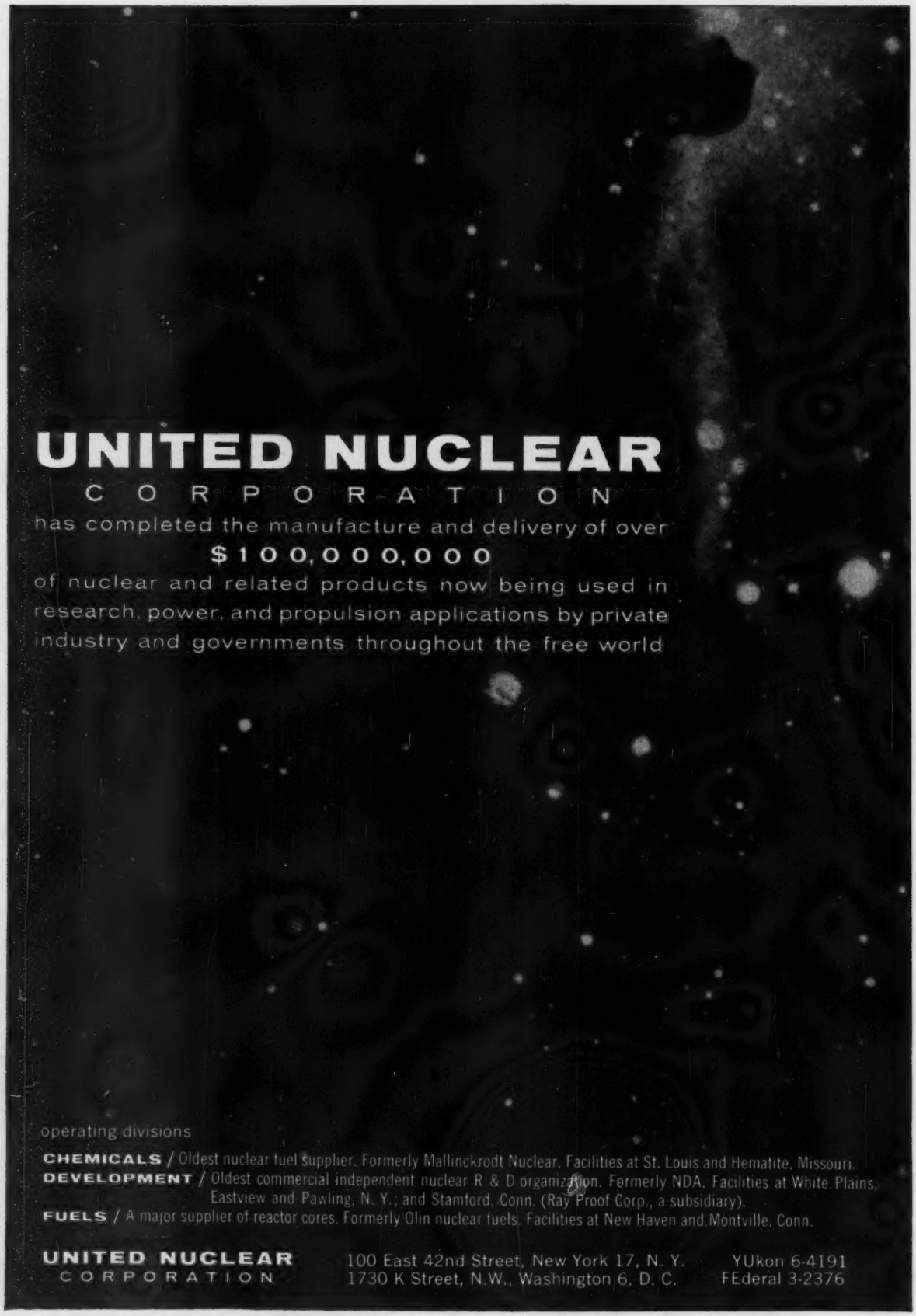
McGRAW-EDISON COMPANY

Transclosures

McGRAW EDISON

529

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT


UNITED NUCLEAR
CORPORATION
has completed the manufacture and delivery of over
$100,000,000
of nuclear and related products now being used in research, power, and propulsion applications by private industry and governments throughout the free world
operating divisions
CHEMICALS / Oldest nuclear fuel supplier. Formerly Mallinckrodt Nuclear. Facilities at St. Louis and Hematite, Missouri.
DEVELOPMENT / Oldest commercial independent nuclear R & D organization. Formerly NDA. Facilities at White Plains, Eastview and Pawling, N. Y.; and Stamford, Conn. (Ray Proof Corp., a subsidiary).
FUELS / A major supplier of reactor cores. Formerly Olin nuclear fuels. Facilities at New Haven and Montville, Conn.
UNITED NUCLEAR
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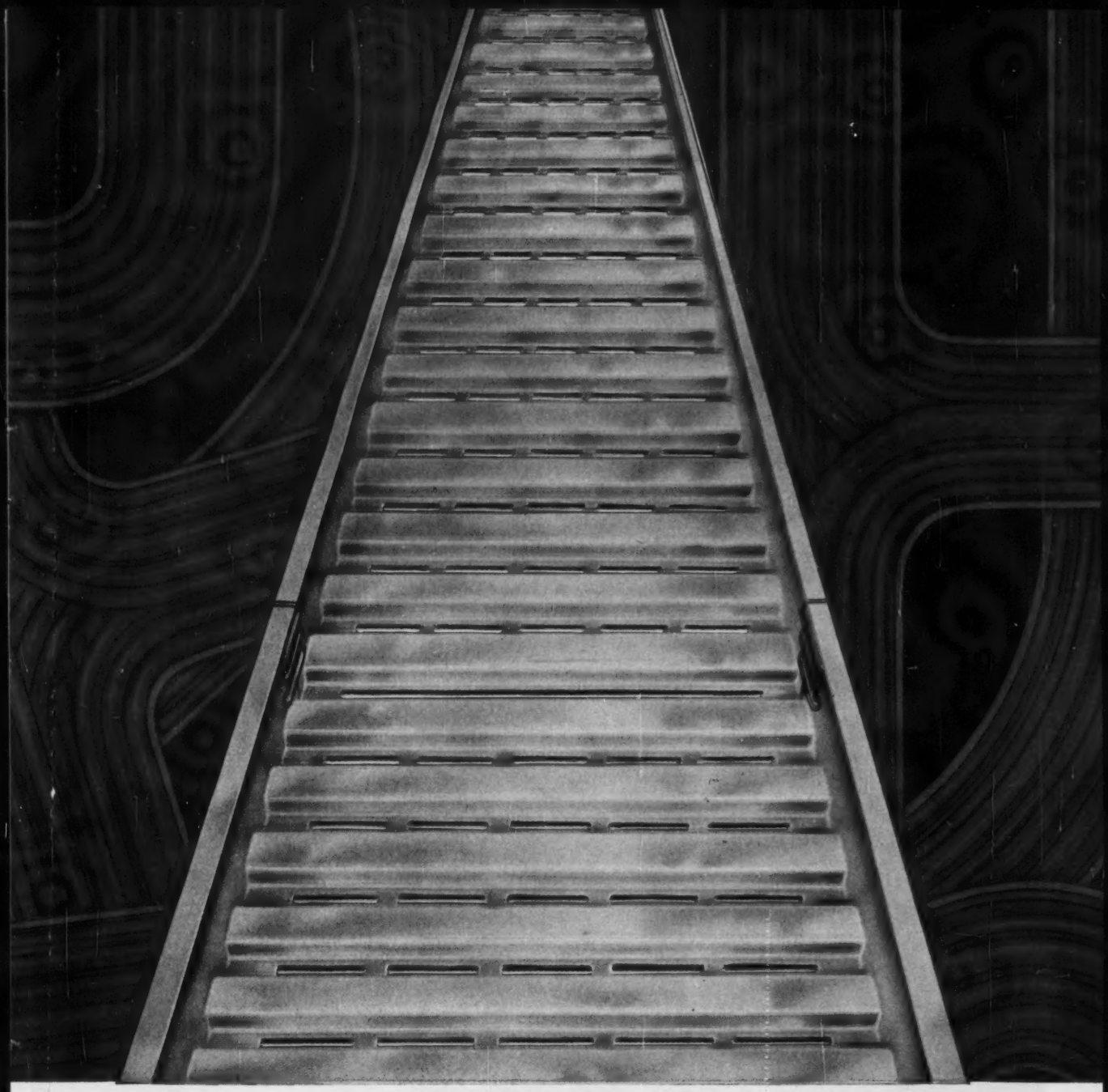


New HUSKY Ventrib*!

The low cost cable-carrier, quality engineered with Husky experience

The VENTRIB basket carrier is Husky's new, low cost addition to its growing line of cable support systems. Primarily designed to handle control cable, it is carefully pre-engineered for simple installation. Unusual slotted design provides maximum ventilation while permitting easy banding and/or clamping of cable. The overall corrugated VENTRIB design achieves optimum strength with a minimum of weight. Adhering to the highest standards of Husky workmanship and design, the VENTRIB basket carrier is supplemented by a full line of fittings and support materials.

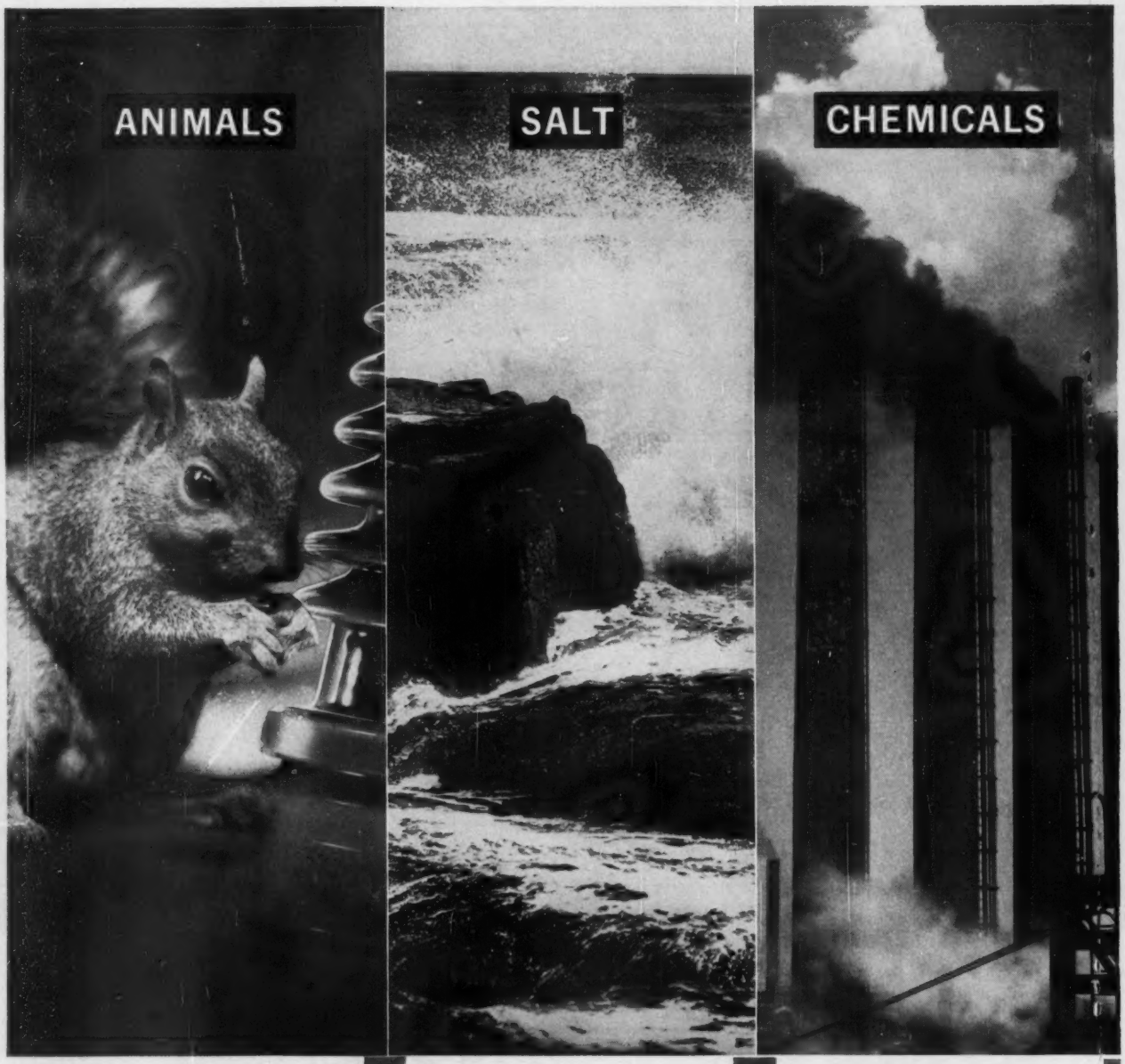
Available in most popular industry sizes, VENTRIB is stocked for 24 hour shipment. For the latest word on this new Husky system, write for the VENTRIB catalog.

HUSKY - DIV. OF **BURNDY** CORP., 5300 VINE ST., CINN. 17, OHIO

QIKLOK* Coupling Secures Sections Sound mechanical joint with 3 prong coupling. Ease of installation saves time and money.

*TM
91-55

ARMORTEC STANDS UP TO



ARMORTEC eliminates outages due to birds and animals. Applied up to six times thicker than conventional paint coatings. Provides 1,100 volts per mil insulation on the transformer tank, cover and cover band.

ARMORTEC coating is uniform. Sharp edges and corners fully protected. Armortec leaves no room for rust and corrosion from salt spray . . . 10,000 hours of salt spray test had no effect.

ARMORTEC is pure vinyl. Caustics from industrial smokestacks can't hurt it. Armortec is corrosion-proof . . . over 6,000 hours of weatherometer exposure proved it.

COSTLY TRANSFORMER ENEMIES!

Check how much Armortec will save you!

Trouble Source	Your Costs for Transformer Repair and Replacement
Birds and animals	$.....
Corroding salt spray	$.....
Industrial fumes	$.....
Sun and windblown sand	$.....
Transportation and installation handling	$.....
TOTAL	$.....

Armortec stands up to these costly transformer enemies . . . Protects transformers like no other coating.

Armortec is not paint. It is pure vinyl plastic. It is fusion-bonded to the entire exterior transformer surface: the tank, cover and band. It is tough, resilient, indestructible. Armortec protects your transformer investment from everything under the sun!

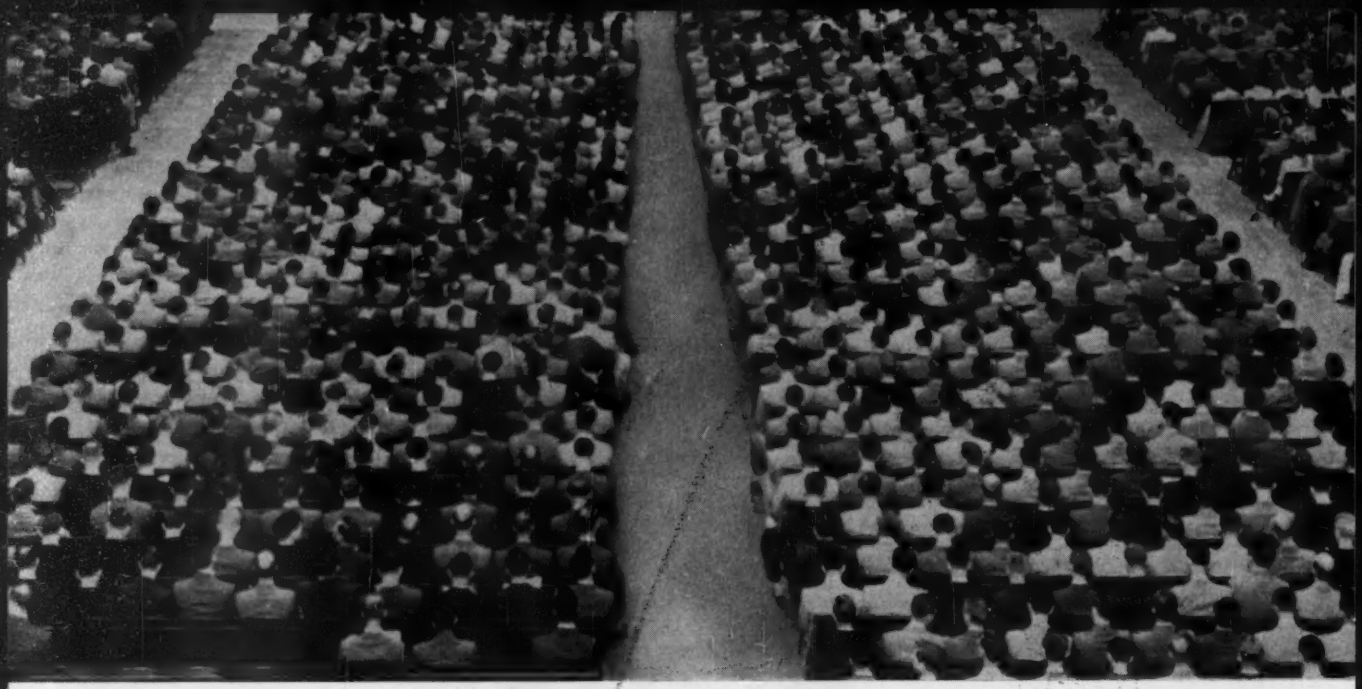
Save transformer repair and replacement dollars with Armortec. Standard on all R T & E pole-type transformers . . .

AT NO ADDITIONAL PRICE

ARMORTEC is unaffected by sunlight. Won't blister, peel, chalk, or craze. Armortec is abrasion resistant. It has the resiliency of rubber, shrugs off driving sand . . . verified by actual sand blast demonstrations.

ARMORTEC is tough. It can take rough handling. Armortec can't be chipped off because it's fused to the metal. Grueling impact testing proved Armortec 100 times superior to conventional paint.

RT&E
CORPORATION
Waukesha, Wisconsin
Portland, Oregon
Arlington, Texas



Are you buying an audience..

..or just a crowd?

This symbol is the tipoff. It stands for the Audit Bureau of Circulations. It tells you (the reader) that the reader of this magazine is the boss, and that our editors know it.

It tells our advertisers two things —that this magazine's circulation has been audited by an outside independent organization according to set standards...

...and that *each member of the audience paid for his seat.*

Because ABC insures an honest count audit an advertiser knows what he is buying. And because ABC stands for *paid circulation* an advertiser knows his ad has the best possible chance to get each man's attention.

This combination marks the difference between buying an audience, or just a crowd.

Electrical World has been a member of ABC for 46 years. You will also see the ABC emblem on all other magazines published by our parent company, McGraw-Hill, at 330 West 42 St., New York 36, N. Y.

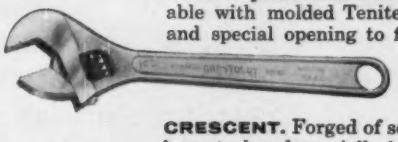
Electrical World

HEFT this CRESCENT adjustable wrench. Feel its perfect balance...its comfortable weight. Shake it...there's no rattle or clank. Slide your thumb across the knurl. See how easily and precisely the jaw moves from "closed" to "full-open" without a hitch. Notice that you can do this every time with *one* hand... the *only* hand you may have free on a pole.

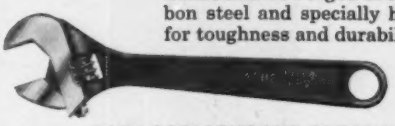
These are the things you can *see* that tell you this is a CRESCENT wrench. What you *can't* see are the more than 80 separate and painstaking steps that go into making this tool... from the first ear-splitting sock of the drop hammer on white-hot alloy steel to the final hand-polishing and strength test.

All CRESCENT tools are made with precision like this... to make tough jobs easier and safer for every man on the line. That's the reason why so many utility companies and contractors have *standardized* their equipment with CRESCENT Linemen's tools.

CRESTOLOY. Forged of super-hard Crestoloy Steel. 200% stronger than conventional adjustable wrenches. Chrome plate finish. 12" size available with molded Tenite insulation and special opening to fit 4/0 taps.



CRESCENT. Forged of selected carbon steel and specially heat-treated for toughness and durability.



BOTH CRESCENT AND CRESTOLOY WRENCHES CARRY THE SAME CRESCENT GUARANTEE OF LASTING QUALITY.

Sign of the Artisan Symbol of Excellence

CRESCENT TOOLS
Give Wings to Work®

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

KPF switches

Trouble-free Simplicity

of design, of operation

INSTALL KPF switches more quickly on hot or dead lines, at less cost. Just bore holes in crossarms, mount phase units, connect conductors. No precision requirements, no heavy extra mounting structures, no temperamental complex mechanism to bind, freeze, malfunction or need lubrication.

Rugged, lightweight KPF switches have proved their dependability and economy in half a century of major utility service. Make a test installation on your system—this month.

Fully closed.
Bell crank on crossarm, operated by control rod, will rotate switch blade arm clockwise away from stationary arm holding switch contact clip.

Switch blade arm partially rotated.
Switch blade has separated from clip. Quick-break whisker carries current, prevents arcing.

Switch fully open.
Quick-break has snapped free instantly, preventing arcing. KPF switches operate smoothly despite icing, crossarm warpage; never need lubrication.

KPF ELECTRIC CO.
P.O. Box 1257E
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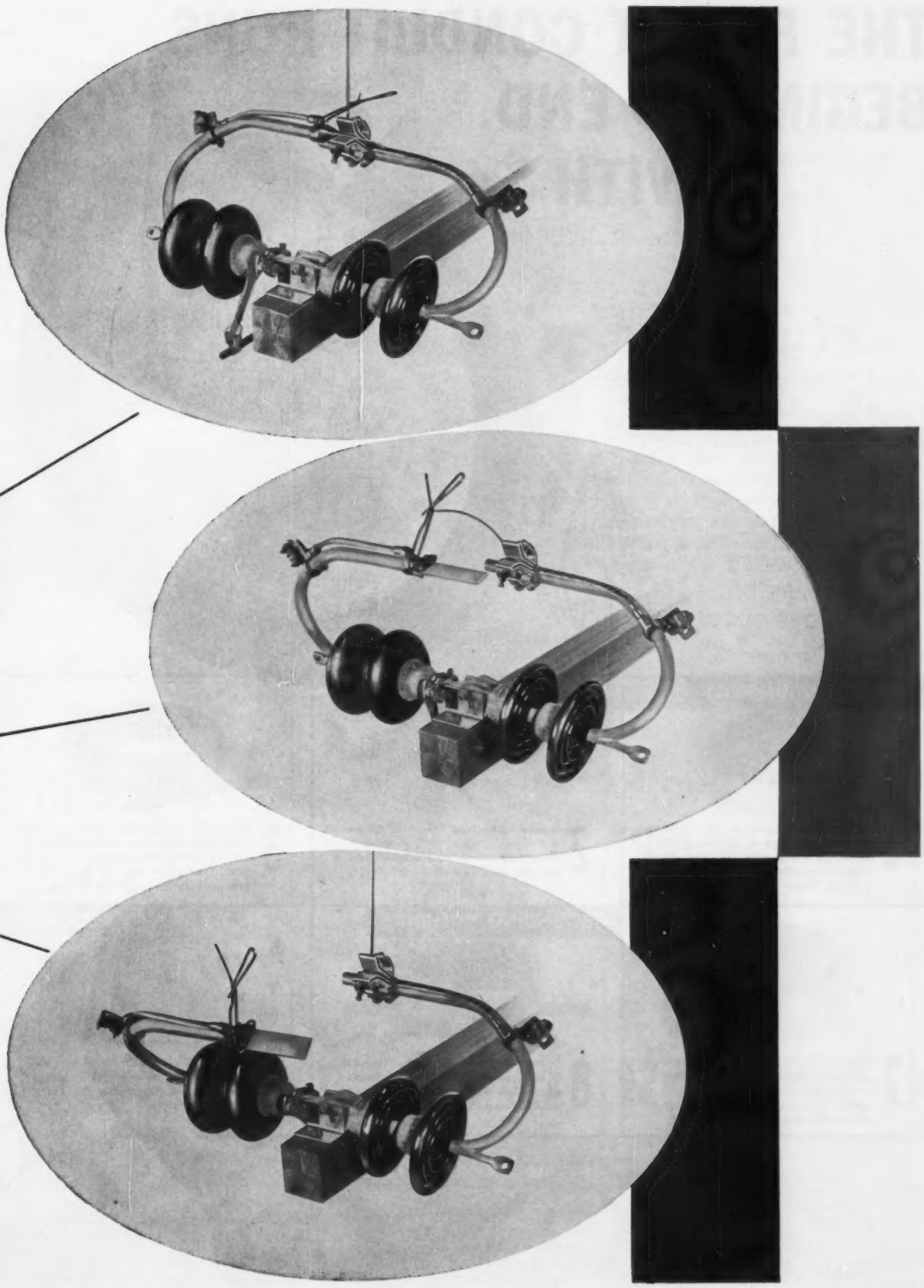
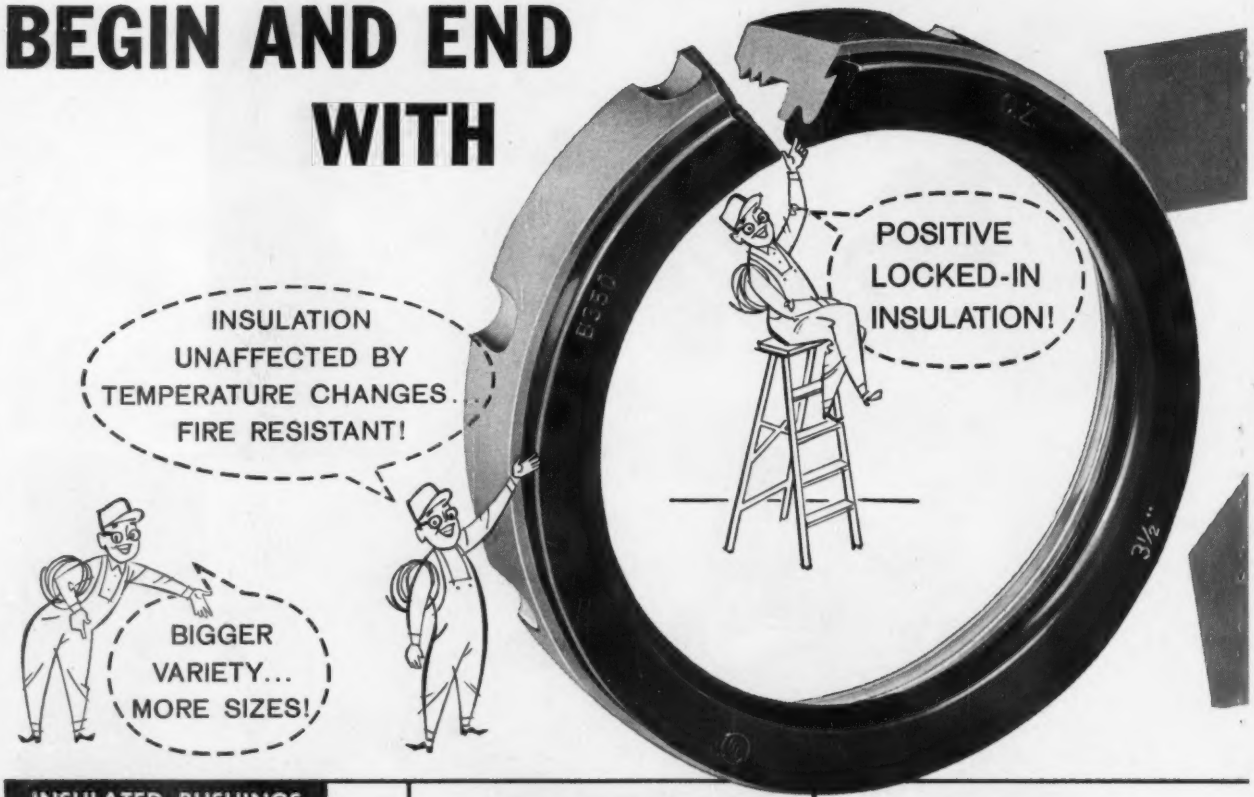


THE FINEST CONDUIT RUNS BEGIN AND END WITH



INSULATED BUSHINGS

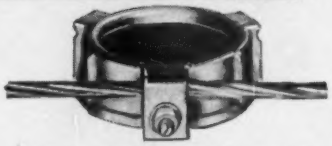
1 Type "B" — Designed for prevention of grounds. Made of highest grade malleable iron or steel, insulated with Bakelite molded and locked into bushing. Sizes: ½" to 6".

2 Type "AB" — New addition to the O.Z. line... made of high-strength aluminum alloy with interlocked Bakelite insulation. Sizes ½" to 6".

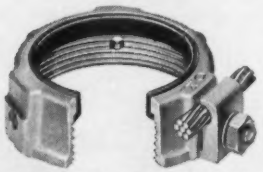
3 Type "BL" — Combines protection of insulated bushing and means for making quick, positive ground connections. Consists of Type "B" equipped with combination lug. Sizes: ½" to 6".

7 Type "E" — For spacing and individually insulating wires as they emerge from conduit. Molded canvas Bakelite covers have high dielectric and mechanical strength. Sizes: ½" to 6".

GROUNDING BUSHINGS



8 Type "GB" — Corrosion-resistant bronze. Ideal for grounding banks of conduit where metallic-protected cable is used. Sizes: ½" to 6".



9 Type "IGB" — Similar to "GB" except insulated with Bakelite collar locked into bushing. Sizes: ½" to 6".

Z bushings

O.Z. holds the line on quality — with the line that gives you greatest selection!

Whatever your bushing requirements, O.Z. has the type and size you need! As with all O.Z. products, *completeness* is the keynote! And, as always, this completeness is backed by another O.Z. constant: *quality!* O.Z. bushings utilize only the traditionally-superior materials: Cadmium-plated or hot-dip galvanized iron and steel, bronze, and molded canvas Bakelite . . . all at prices competitive with substitute materials . . . all time-proven in finer conduit runs everywhere. For more information on O.Z. bushings, call your local O.Z. distributor or write direct to the company.

4 Type "SB" — For use on conduit having no threads. Case-hardened cup-point set screws for fastening. Sizes: ½" to 6".

5 Type "SBT"—A cadmium-plated bushing for thin-wall conduit application. Fastens with case-hardened, cup-point set screws. Sizes: ½" to 2".

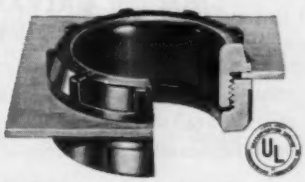
END BUSHINGS

6 Type "EL" — Provides the protection of end fittings and permits quick, positive ground connection by means of combination lug. Sizes: ½" to 6".

INSULATING BUSHINGS

10 Type "A" — Made of molded canvas Bakelite having high dielectric and mechanical strength. Sizes: ½" to 6".

11 Type "BB" — Molded Bakelite. Male thread. Installed with locknut. Insulates cables passing through metal boxes or troughs. Sizes ½" to 6".



12 Type "ABB" — Combination of Type "A" and "BB" bushings to insulate cables passing through metal boxes or troughs. Sizes: ½" to 6".

O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

Sales Office and Warehouse: 406 So. Cicero Avenue, Chicago 44, Ill. • ESterbrook 9-0326
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- CAST BOXES
- CABLE TERMINATORS
- POWER CONNECTORS
- SOLDERLESS CONNECTORS
- GROUNDING DEVICES
- CONDUIT FITTINGS
- INTERLOCKED ARMOR CABLE FITTINGS

Choose from three Bethlehem ACSR core wires

Now your conductor manufacturer can supply all three types of Bethlehem ACSR core wire—Bethalume (aluminum-coated), Bethanized (electrolytically zinc-coated), and hot-dip galvanized. Bethlehem can give you a coating and a coating weight to meet virtually every atmospheric condition.

BETHALUME FOR SEVERELY CORROSIVE ATMOSPHERES

The Bethalume (aluminum) coating provides a highly effective resistance to corrosion because a protective oxide forms on the exterior surface as soon as the wire emerges from its molten aluminum bath. Bethalume core wire is manufactured in accordance with ASTM Specification B-341.

BETHANIZED FOR A VARIETY OF COATING WEIGHTS

Our unique electrolytic process—Bethanizing—gives the wire a tightly bonded and uniform coating of pure zinc. Since coating weights can be closely controlled, Bethanizing makes possible coatings two and three times the standard weight. It meets ASTM Specifications B-245 and B-261.

HOT-DIP GALVANIZED FOR MANY REQUIREMENTS

Bethlehem's hot-dip method of zinc-coating ACSR core wire results in a highly dependable and economical product. This wire is available with a heavy (double galvanized) zinc coating. It fulfills all requirements of ASTM Specification B-245.

For the complete story on all three Bethlehem ACSR core wires, get in touch with the nearest Bethlehem sales office; or write to us at Bethlehem, Pa.

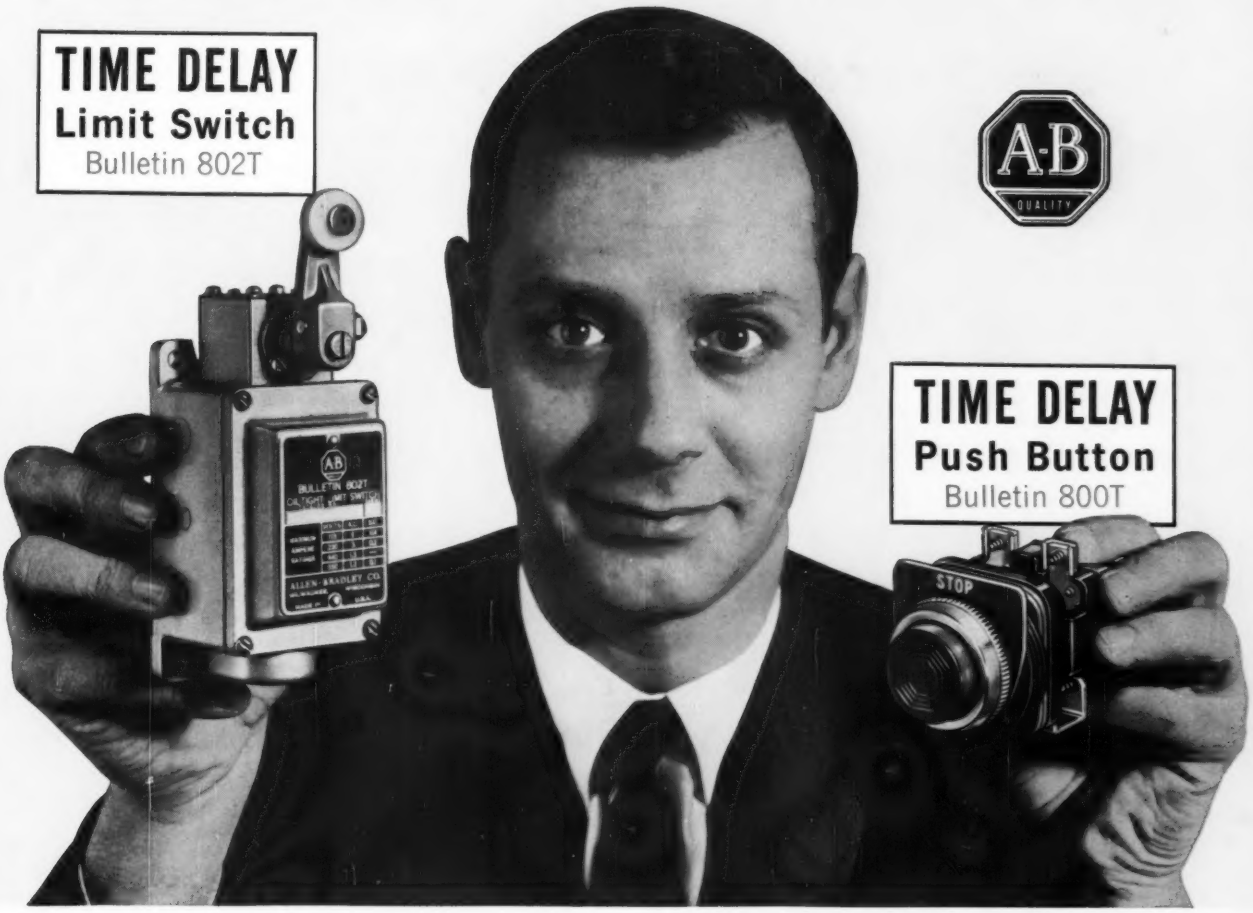
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

Steel *for Strength ... Economy ... Versatility*

BETHLEHEM STEEL

BETHLEHEM STEEL

Something NEW...
designed for your convenience



Adjustable From 1 to 15 Seconds

This new Allen-Bradley development should solve such occasional problems where, upon the operation of the push button or limit switch, a slight time delay should occur. Time delay is adjustable up to 15 seconds—and it can also be introduced when "stopping" the operation—but not in both the "starting" and "stopping" cycle.

Both push button and limit switch are relatively low in cost—ideal for applications where a delay of only a few seconds is desired, and where the repetitive accuracy of the Allen-Bradley Bulletin 849 time delay relay is not necessary. Both units have single pole, double break contacts—either normally open or normally closed. They are no more difficult to install than the corresponding units without the time delay feature.

Machine tool and production system designers should have full information in their files on these new Allen-Bradley time delay push buttons and limit switches. It is yours for the asking. Write today.

13-61-RM

ALLEN-BRADLEY

Member of NEMA

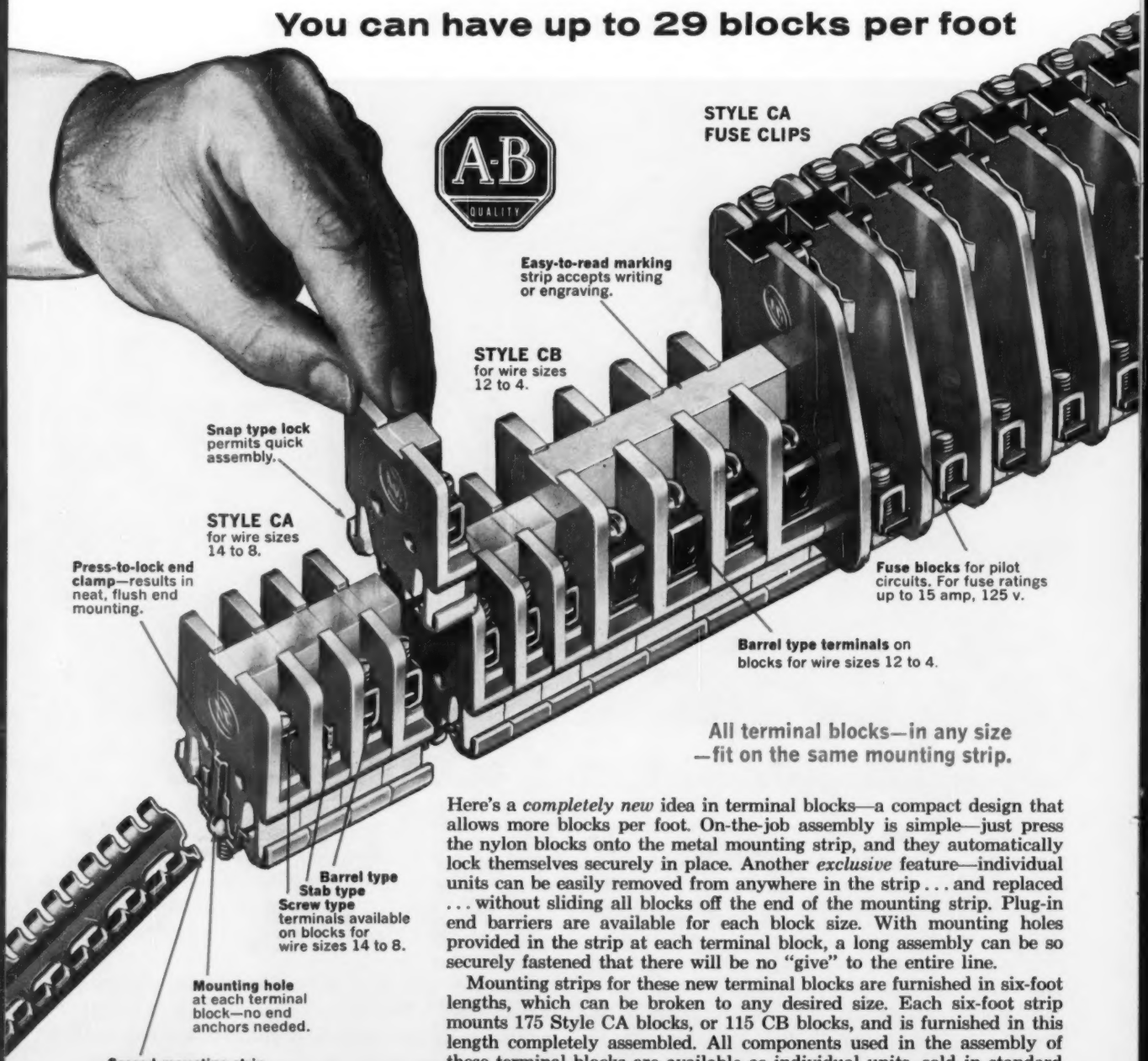
Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

QUALITY MOTOR CONTROL

New ALLEN-BRADLEY BULLETIN 1492 SNAP-ON TERMINAL BLOCKS

save space

You can have up to 29 blocks per foot


A-B QUALITY
STYLE CA FUSE CLIPS
Easy-to-read marking strip accepts writing or engraving.
STYLE CB for wire sizes 12 to 4.
Snap type lock permits quick assembly.
STYLE CA for wire sizes 14 to 8.
Press-to-lock end clamp—results in neat, flush end mounting.
Fuse blocks for pilot circuits. For fuse ratings up to 15 amp, 125 v.
Barrel type terminals on blocks for wire sizes 12 to 4.
Barrel type
Stab type
Screw type terminals available on blocks for wire sizes 14 to 8.
Mounting hole at each terminal block—no end anchors needed.
Scored mounting strip can easily be broken off —without tools—at any desired length.

All terminal blocks—in any size —fit on the same mounting strip.

Here's a *completely new* idea in terminal blocks—a compact design that allows more blocks per foot. On-the-job assembly is simple—just press the nylon blocks onto the metal mounting strip, and they automatically lock themselves securely in place. Another *exclusive* feature—individual units can be easily removed from anywhere in the strip . . . and replaced . . . without sliding all blocks off the end of the mounting strip. Plug-in end barriers are available for each block size. With mounting holes provided in the strip at each terminal block, a long assembly can be so securely fastened that there will be no "give" to the entire line.

Mounting strips for these new terminal blocks are furnished in six-foot lengths, which can be broken to any desired size. Each six-foot strip mounts 175 Style CA blocks, or 115 CB blocks, and is furnished in this length completely assembled. All components used in the assembly of these terminal blocks are available as individual units, sold in standard package quantities. Please write today for more complete information on these new "spacesaving" Bulletin 1492 terminal blocks.

13-61-RM

ALLEN-BRADLEY

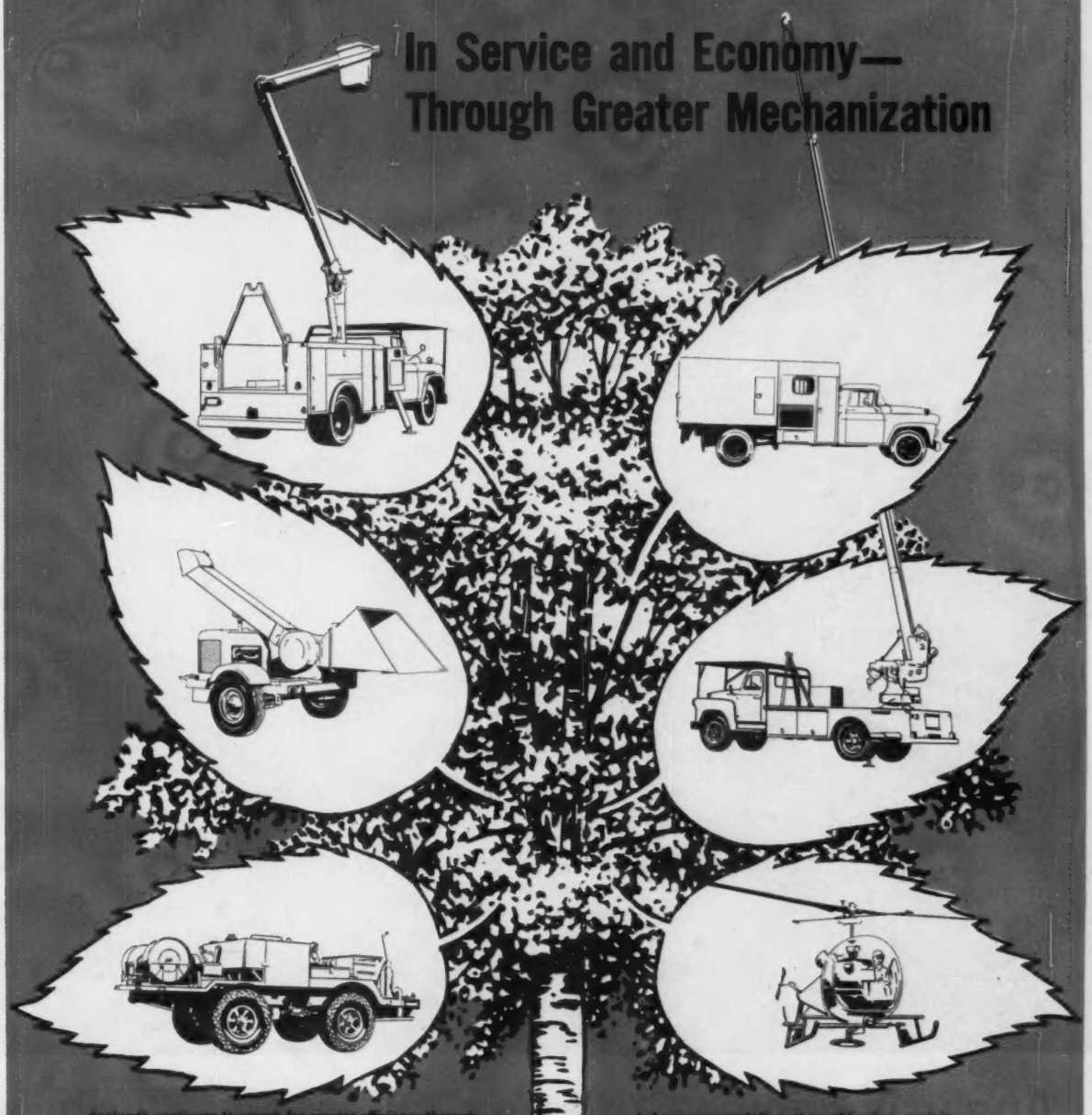
Member of NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

QUALITY MOTOR CONTROL

ASPLUNDH REACHES NEW HEIGHTS

In Service and Economy— Through Greater Mechanization



Asplundh continues to search for greater efficiency through modern equipment • The Asplundh organization, national in scope with experienced personnel and progressive management, is prepared to handle all phases of line clearing, chemical brush control and right-of-way clearing.

Let our representative, at no obligation, explain how your program can best be serviced with Asplundh manpower and specialized equipment.

OFFICES IN PRINCIPAL CITIES

LEFT DOWN
Trim lift, trailer chipper, chemical spray truck

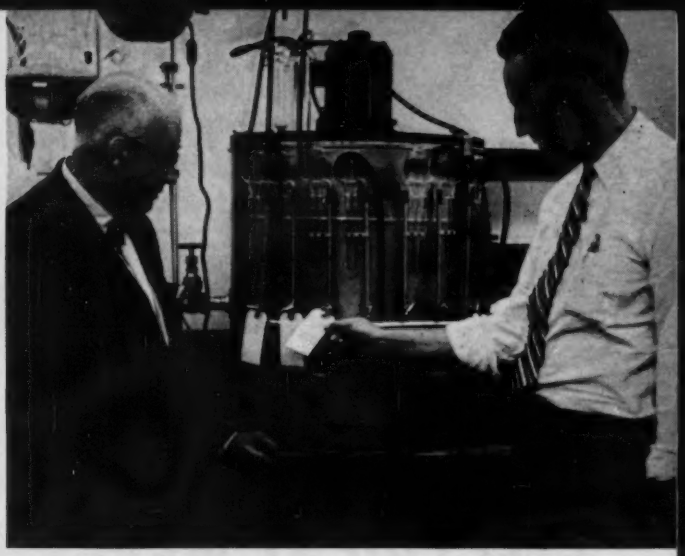
RIGHT DOWN
Truck chipper combination, tree topper, helicopter spray

ASPLUNDH TREE EXPERT COMPANY
505 York Rd., Jenkintown, Pa.

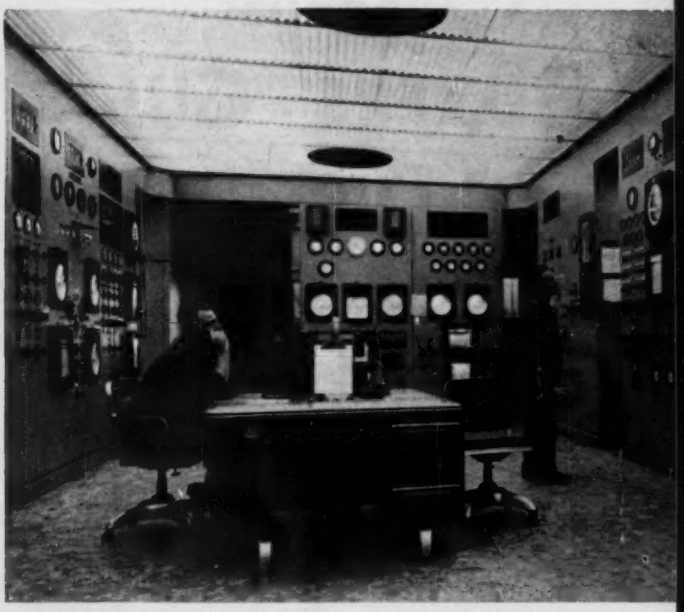
Analysis shows Gulfcrest® Oil close to original

Today, Philadelphia Electric operates nine generating stations that produce more than three million kilowatts. To keep the turbines operating at peak efficiency, chemists from Philadelphia Electric's chemical laboratory conduct tests on oils from all turbines every thousand hours for viscosity, neutralization number, interfacial tension, and color. From their records a pattern for unusually long service life for turbine oil is evident.

The most recent analysis for one turbine generator unit, put into operation in December, 1937, shows the turbine oil to be very near to its original specifications. Viscosity has increased just five seconds; the neutralization number has increased from 0.04 to 0.08 and the color has darkened only slightly. In addition, other units have run up to 175,000 hours and the test results on oil samples are remarkably the same.



T. C. Park, Jr., Gulf Sales Engineer, left, and chemist of Philadelphia Electric are shown here in the chemical laboratory.



Control panels are constantly monitored to assure dependable power service.

This 175,000 kw turbine was installed recently by Philadelphia Electric at its Schuylkill station. The turbine oil: Gulfcrest.

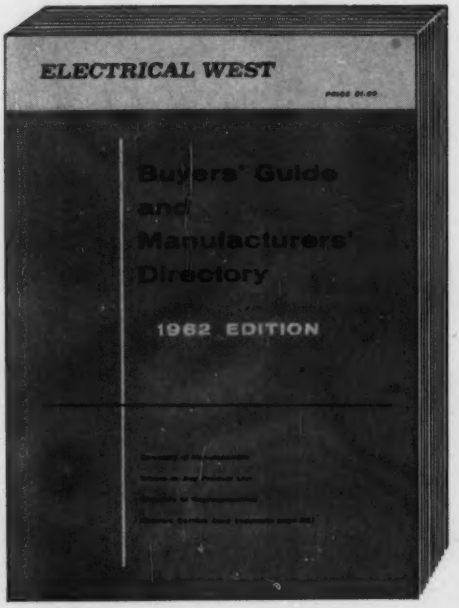
specifications after 24 years of service

Based on these test results, Philadelphia Electric can predict an unusually long service life for Gulfcrest oil. Why not see for yourself how Gulf Makes Things Run Better! Call your nearest Gulf office or write for informative booklet on Gulfcrest turbine oil. Gulf Oil Corporation, Dept. DM, Gulf Building, Houston 2, Texas.

GULF

GULF MAKES THINGS RUN BETTER!

Reserve Advertising Space Now



In The 1962 Edition of *ELECTRICAL WEST'S* annual

BUYERS' GUIDE and DIRECTORY

Used the year round by electrical buyers in the Western States.

The Buyers' Guide and Manufacturers' Directory lists manufacturers of electrical equipment, apparatus and supplies, their Western offices and their Western representatives. It also includes a directory of Manufacturers' Representatives handling electrical lines. An ELECTRICAL WEST service for 27 years.

MANUFACTURERS and REPRESENTATIVES:

Your advertising in the BG & D will:

1. **REACH** more than 13,000 subscribers who include the important buyers of electrical apparatus, wiring devices, supplies, lighting and supplies in the 13 Western States.
2. **BE USED** many times during 1962. Usage of this Directory is thoroughly established—it's the only quick and convenient guide published exclusively for the West's great electrical market.
3. **EMPHASIZE** your products, and your Western facilities. It will make your sales efforts more efficient, more profitable.

Look it up First . . . . . .

in the West's only Buyers' Guide for Electrical Equipment

Includes

Directory of Manufacturers
Directory of Representatives
Where-to-Buy Product List

Reserve space now for Buyers' Guide & Directory advertising. Early reservations assure position near your Directory listing. For rates and mechanical specifications contact any one of our District Offices below.

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CHICAGO 11: 645 N. Michigan Ave., MOhawk 4-5800
CLEVELAND 13: 55 Public Square, SUperior 1-7000
DALLAS 1: 1712 Commerce St., RIverside 7-5117
DENVER 2: 1700 Broadway, ALpine 5-2981
DETROIT 26: 856 Penobscot Building, WOodward 2-1793
HOUSTON 25: W-724 Prudential Building, JAckson 6-1281
LOS ANGELES 17: 1125 W. Sixth St., HUntley 2-5450
NEW YORK 36: 500 Fifth Ave., OXford 5-5959
PITTSBURGH 22: 4 Gateway Center, EXpress 1-1314
PORTLAND 4: 445 Pacific Building, CApitol 3-5118
SAN FRANCISCO 4: 255 California St., DOuglas 2-4600; T. H. Carmody, Adv. Sales Mgr.

ELECTRICAL WEST

A McGraw-Hill Publication

5 KV ? 15 KV ?

HIGH-VOLTAGE CABLES—IN THE LENGTH YOU NEED—NOW AVAILABLE "OFF THE SHELF"

More and more contractors are being invited to bid on projects which include high-voltage cable.

Now *you* can go after this profitable business, because Rome has made it possible for you to:

1. Get the cable you need, *when* you need it, in the *length* you need.

2. Get cable of the *quality* the job requires. (In high-voltage work, "second best" cables can eat up your profits during call-back after call-back.)

Today you can order the length of high-voltage cable you need—ten feet or ten thousand—right "off the shelf," through Rome's new stockpiling program.

And you'll get the quality your customers expect—the same Rome cables that have earned their reputation the hard way: through miles upon miles of high-voltage jobs over the years.

Popular sizes 5 and 15 kv Rozone Roprene single-conductor cables are currently being stocked at Rome in the sizes most frequently needed.

This gives you a quick answer to a wide variety of cable problems. Rozone is a versatile, long-life insulation that resists ozone and moisture. Roprene is tough neoprene jacketing that resists weather, fire, oils, chemicals, heat and aging.

Start on your next job Your next bid may be on a school, commercial building, or industrial plant which requires high-voltage cable. Be ready for this business. Your Rome distributor is the man to call for 5 and 15 kv cable. Ask him about it this week.

Rome Cable Division of Alcoa, Dept. 1-91, Rome, N. Y.

ALCOA
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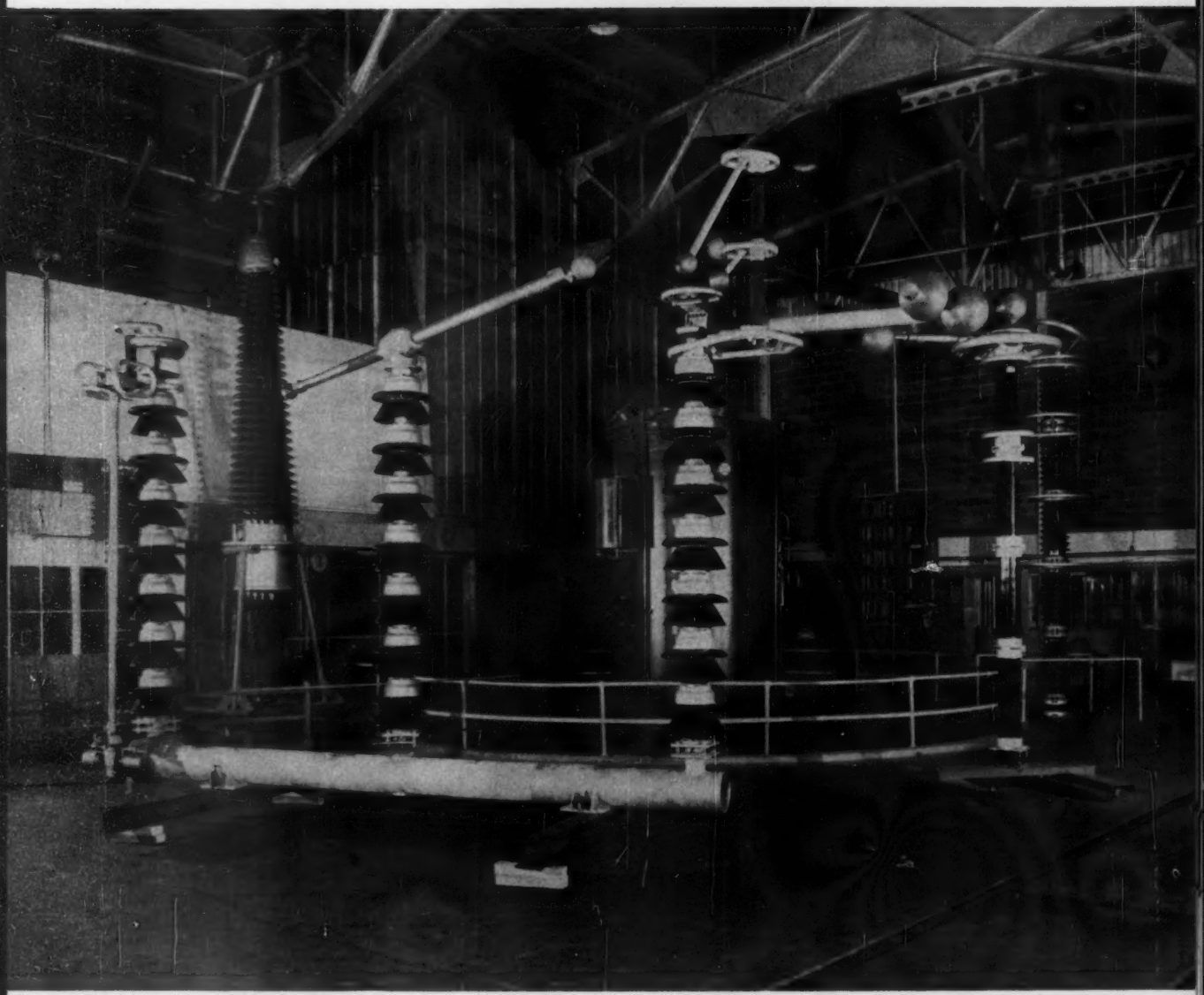
TESTED AND PROVED!

SOUTHERN STATES RDC SWITCH

UNDERGOES BATTERY OF TESTS TO ASSURE TOP PERFORMANCE



SOUTHERN STATES RDC SWITCH undergoing tests in Ohio laboratory. Here this 345 kv unit was tested for visual corona, riv, and dielectric properties. From this laboratory the switch was shipped to Pennsylvania State University for further tests.

Lengthy, expensive laboratory tests are necessary to make sure an air switch will perform satisfactorily at extra high voltages. Take the Southern States 345 kv RDC double side-break air switch, for example. Here are some of the most important tests involved:

Temperature Rise The RDC had to prove its ability to carry rated currents continuously without exceeding allowable temperature rise.

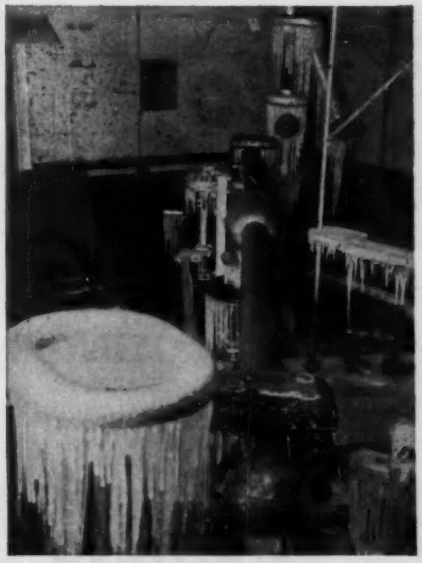
Visual Corona, RIV, Dielectric A high voltage laboratory was employed to make these tests. The results: no visual corona at 220 kv, the normal line-to-ground voltage for a 345 kv system. Not until voltage of 278 kv was applied did corona appear. When the switch was energized at 296 kv a radio influence voltage of 100 microvolts occurred. Dielectrically, the RDC passed all tests called for in NEMA's Publication SG6-1960.

Icing Pennsylvania State University performed a series of tests proving the capabilities of the RDC under severe icing conditions. (See photos at right.)

Momentary Current Amplitact contact construction as used on the RDC has withstood momentary currents up to 114,000 amperes without damage.

Those exhaustive tests, conducted in the nation's most capable laboratories, are extra assurance that the RDC will live up to expectations and then some!

RDC IN CLIMATOMETER where it was exposed to freezing rain conditions. After ice coating averaging ¾-inches was deposited, ice was allowed to harden before operation. Photo at top shows the switch fully iced. Photo at bottom shows the switch after it was opened. Further tests were made to check the switch's ability to close under icing conditions. In both opening and closing tests the RDC operated satisfactorily.



WHY YOU CAN EXPECT BETTER PERFORMANCE OF THE RDC SWITCH AT HIGH VOLTAGES

The double side-break RDC switch has many inherent advantages over vertical-break switches, making it especially well suited for application at extra high voltages:

The switch blade is perfectly balanced on the rotating insulator; it does not have to be lifted for the opening sequence, a particularly significant advantage under severe icing conditions.

The contacts are better protected from ice accumulation by the overhang of the top contact housing, made possible because the blade swings in a horizontal plane.

The sleek design and configuration are important, too. The mechanism is enclosed in the streamlined, bronze housing located on the center insulator. There are no projecting arms, cranks or elbows to disturb its smooth, corona-resistant contours.

Hundreds of applications throughout the nation prove the capability and dependability of this sound, ruggedly-built switch. The RDC is suited for application at voltages from 34.5 kv to 460 kv.

Get full facts from your Southern States representative or write us for Bulletin 57RDC.

SOUTHERN STATES

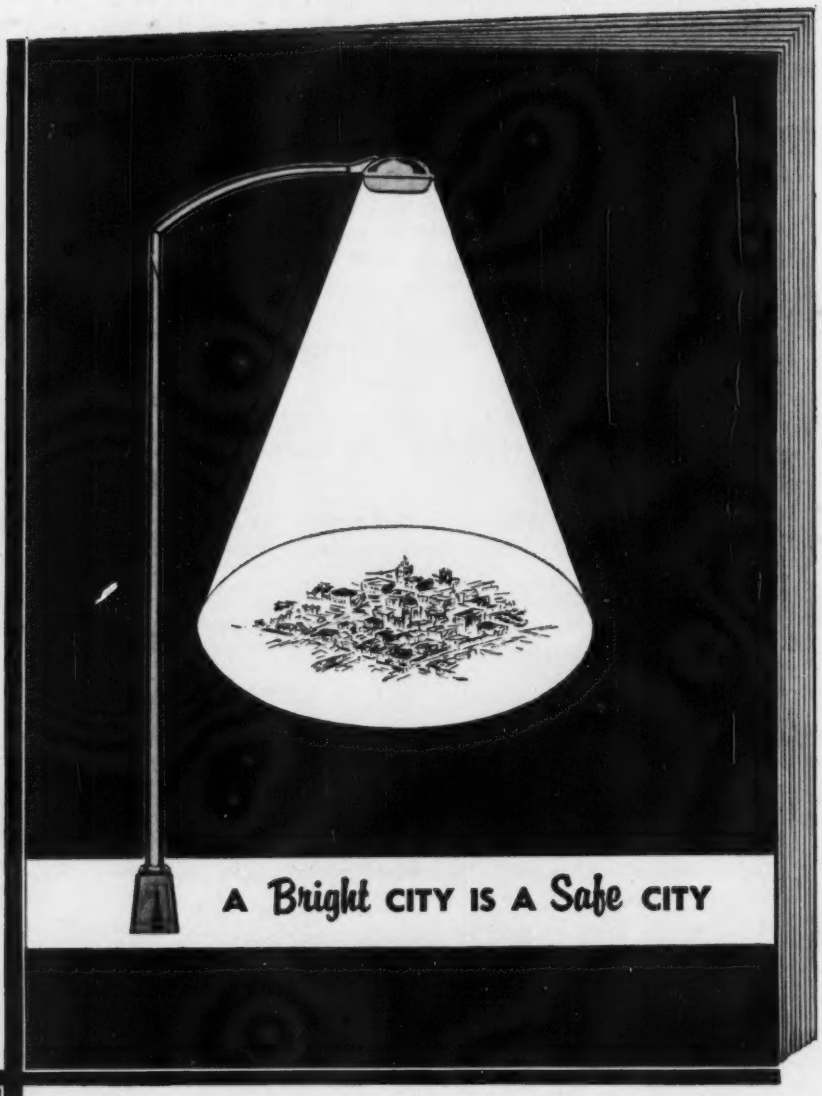
HAMPTON, GEORGIA

IN CANADA: DOMINION CUTOUT CO., LTD., TORONTO

free guide

TO PLANNING AND PROMOTING

STREET LIGHTING PROGRAMS



Here's help for those planning street lighting programs. "A Bright City is a Safe City" contains charts and tables on traffic volume, light intensities, pole spacing, mounting heights and other valuable information. It also describes and illustrates relighting projects of specific cities and towns. Get YOUR FREE copy NOW!

Published in the interest of better lighting for our streets and highways.

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The facts about transistorized 2-way radio

(FROM THE LEADER IN RADIO—RCA)

If you're cautious about specifying transistorized 2-way radio for your business . . . if you don't have full facts on the newest developments in radio communications equipment . . . you'll want to read this "Best Seller" by RCA. It's a fact-filled booklet that delves inside the "LD" (Low battery Drain) Mobile Radio; shows you why the "LD" gives you all the advantages of transistorization at a price comparable to all-tube equipment. Transistorized—yet easily serviced. Miserly in power consumption—yet generous in performance.

Check These Important Sections:

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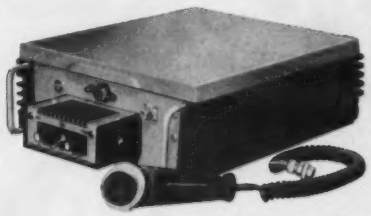
- Why Transistors?
- Nationwide Servicing

Read all about 2-way radio. You'll see why the new "LD" is today's best buy! Send coupon for your copy of this informative booklet.



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mum over-all power piping investment. Kellogg's Power Piping Division welcomes the opportunity to tell you more about its power piping center in Williamsport, Pa., and its manufacturing services located there. Write for a new brochure—soon to be available.

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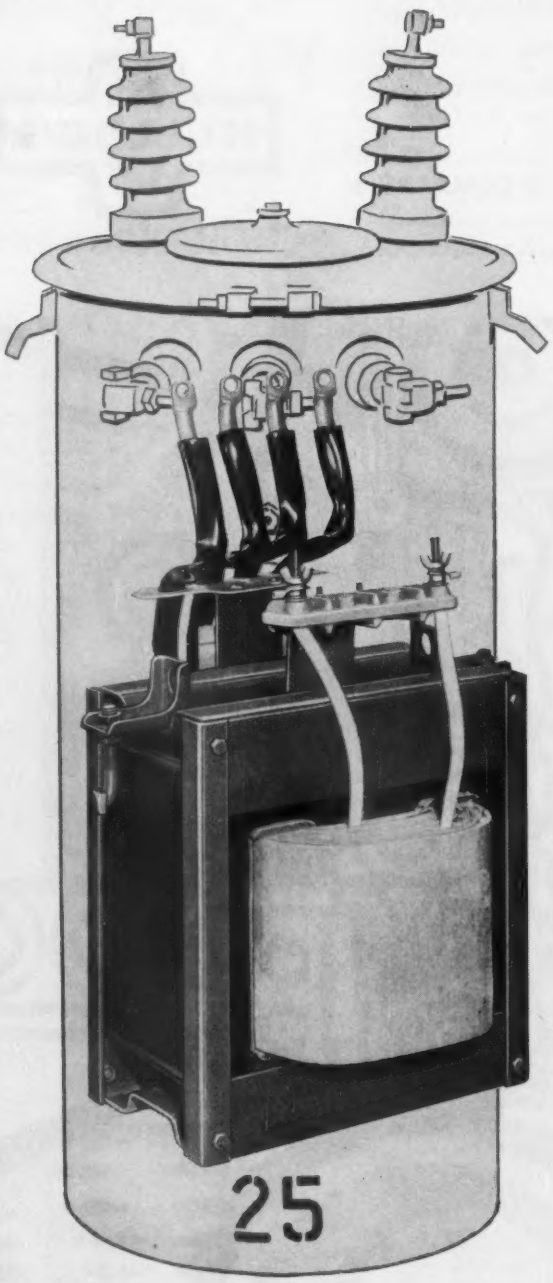
HEADQUARTERS



Central's "7000" Series Distribution Transformer with DURA-PAK Core and Coil has a 2.5 to 1 Copper-to-Core Loss Ratio!

LOWER TOTAL LOSSES

DURA-PAK features lower copper losses, lower total losses, lower impedance and better regulation (especially during peak load conditions) to give the utility LOWER OPERATING COSTS, INCREASED LOAD REVENUES and FEWER CHANGE OUTS.

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DURA-PAK's rugged, compact construction, plus a special thermo-setting bonding agent, assures INCREASED SHORT CIRCUIT STRENGTH.

Central's constant emphasis on QUALITY led to the design of the DURA-PAK Core and Coil Assembly in which a 2.5 to 1 copper-to-core loss ratio has been achieved—*with no appreciable increase in core loss.* It was this same emphasis on QUALITY which led to the completely new overall design of Central's "7000" Series Distribution Transformer—the transformer with COORDINATED E-T-M* FACTORS.

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model 1044a

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Versatile, pre-designed structure components are the key to Westinghouse modular design outdoor substations. You simply furnish a station one-line diagram, arranged to indicate relative location of major apparatus and direction of supply lines and feeders — and let experienced Westinghouse substation designers do the rest.

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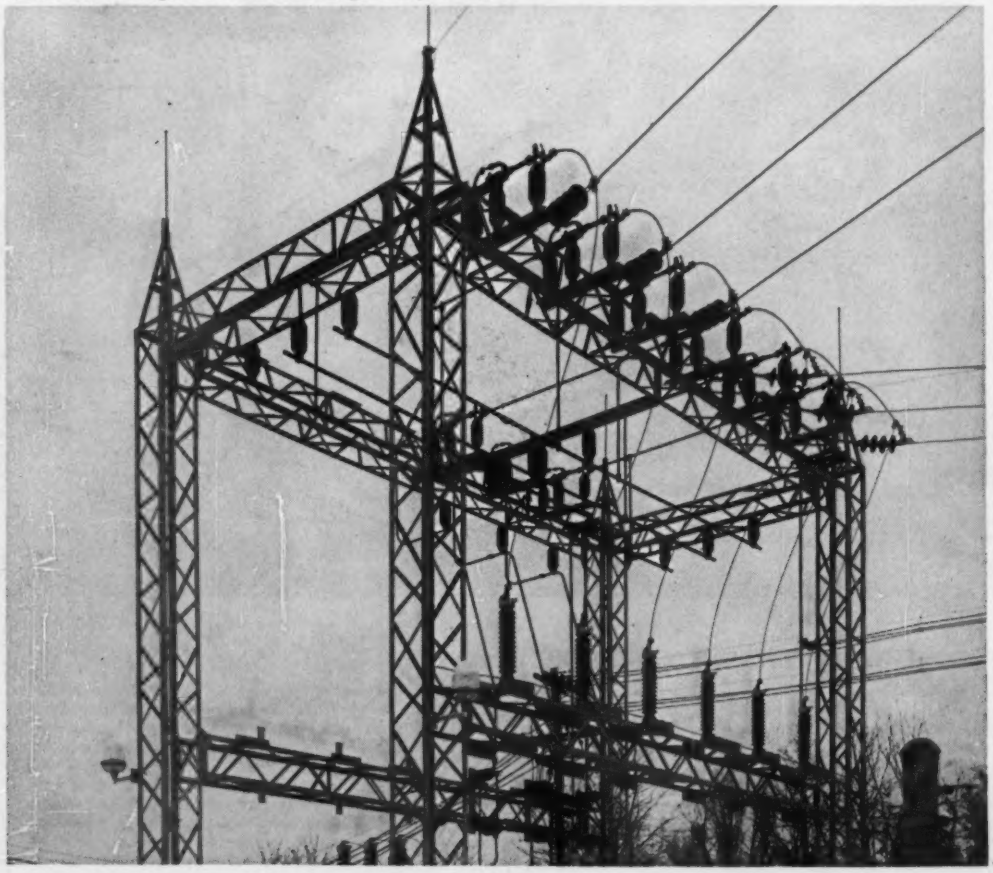
- *Easy Field Erection*. . through use of interchangeable members, which eliminates shop errors and permits rapid assembly.
- *Superior Product Integration*. . through single-manufacturer responsibility.
- *Simplified Planning and Fast Delivery*. . from single-line diagram to shipment of the ready-to-erect substation, this modular technique requires minimum time.

Let Westinghouse design and coordinate your outdoor substation under the modular plan. For complete information, call your Westinghouse representative or write Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30, Pa.

You can be sure . . . if it's Westinghouse

Westinghouse

Pennsylvania Electric Company's West Sayre substation shown here is a good example of a substation planned and built with Westinghouse modular design components.



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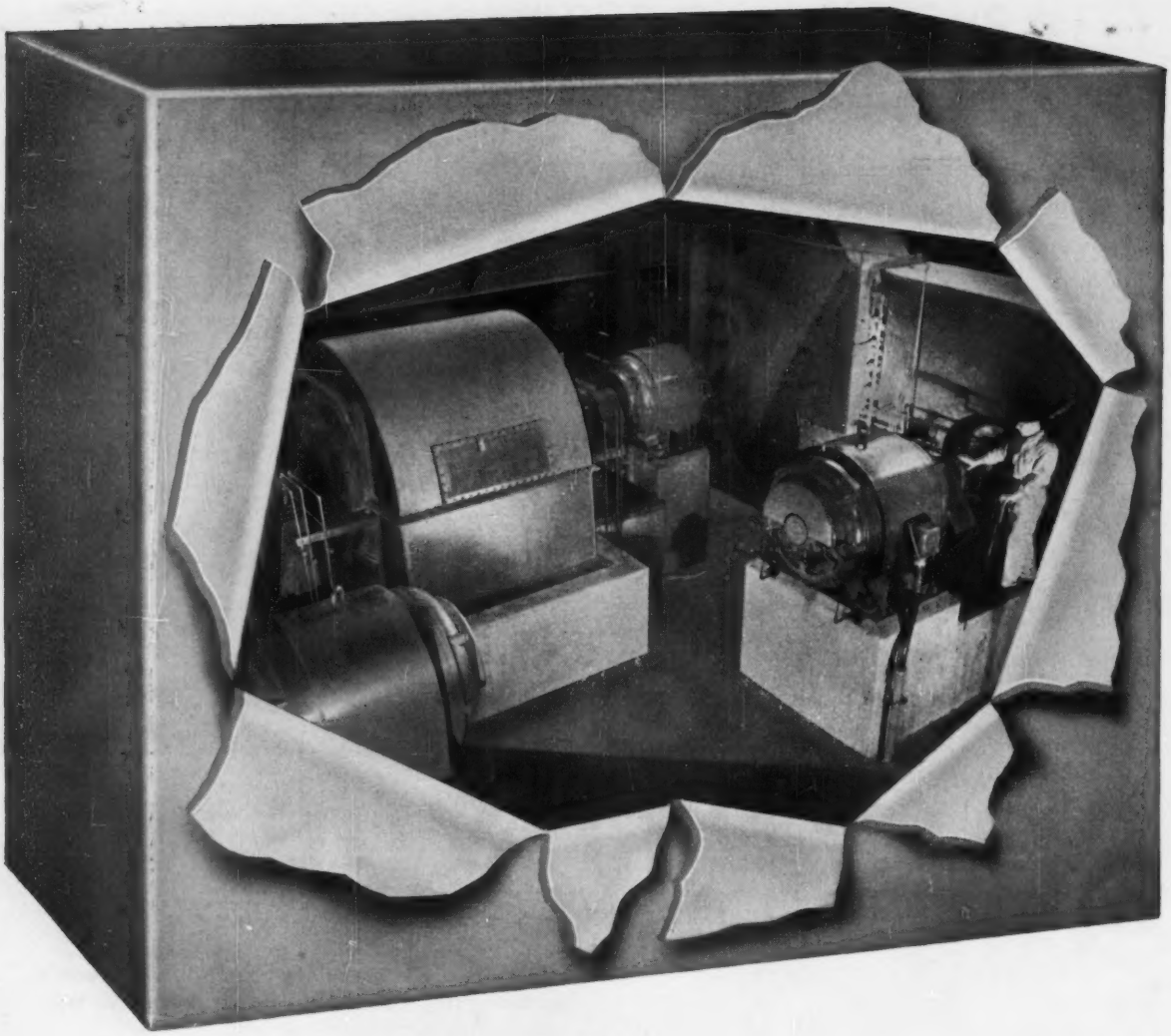

More power to ALTON BOX BOARD

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Mechanical draft is among several assignments of Clarage equipment at Alton Box Board Co., Alton, Illinois.

On the left above in the power plant, a Clarage Type W, Class III double inlet fan equipped with Vortex Control provides forced draft . . . on the right is one of the two Clarage Type RT double inlet fans furnishing induced draft.

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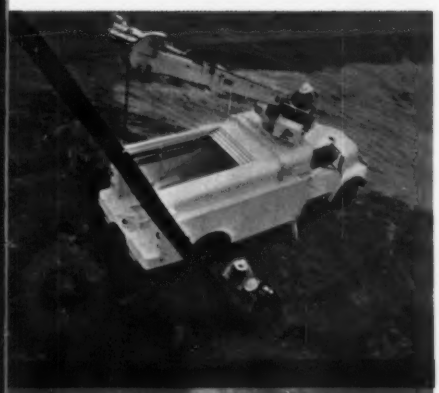
THE NEW PITMAN POLECAT™



WITH EXCLUSIVE

UNI/DYNE TURRET™

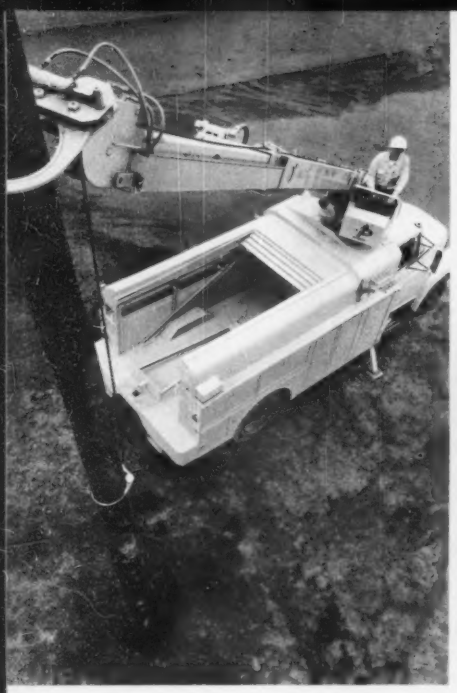
The Pitman Polecat, introduced in 1960, quickly enabled electrical utilities to set new standards of safety, performance and increased crew efficiency. But, successful as it was in replacing muscle with hydraulic power, we knew that even the finest machine *can* be improved.

Accordingly, we focused our attention on the "heart" of the Polecat—the head-unit, which swings and lifts the extendible boom. By taking a completely *new look* at this unit . . . by refining the design of each part, and combining functions wherever possible, we developed the exclusive Pitman Uni/Dyne Turret.

It is stronger and more durable, with rotation system completely contained within the cast steel head—there are no chains, sprockets, exposed gears, cables, or other compromises. Rotation locks instantly when power is removed, provides bedrock stability for digging or lifting materials and men.

Uni/Dyne Turret is extremely compact, enables Polecat unit to be mounted virtually *anywhere* on a utility line truck — new, or in-use. Pitman Polecats, with exclusive Uni/Dyne Turret, are standard on center-mount, corner-mount and top-mount models, and on new top-mount with operator seat. Turn this page for more details!

TM



TOP-MOUNT POLECAT operator has job under full control as he sets this utility pole. Lifting with cable, he grasps pole with the exclusive hydraulic Pitman Pole Claw; then, by rotating his Uni Dyne Turret and inching the "stinger" in or out, he positions pole precisely and holds it steady for tamping.

CORNER-MOUNT POLECAT loads 5,000 lb. transformer into its own truck bed; also unloads, lifts and positions unit aloft. Polecat assembly goes in either rear corner; controls are in opposite rear corner, or Polecat can be remote controlled. Lifting capacity of any model Polecat is 8,000 lbs.

CENTER-MOUNT POLECAT, shown with fiberglass boom extension locked into the extendible boom-tip. Can support one or two fiberglass buckets for work as high as 43′ aloft. Nonconductive rope on extension lifts transformers 39′ up. Operator stands on either side of unit, with duplicate controls.

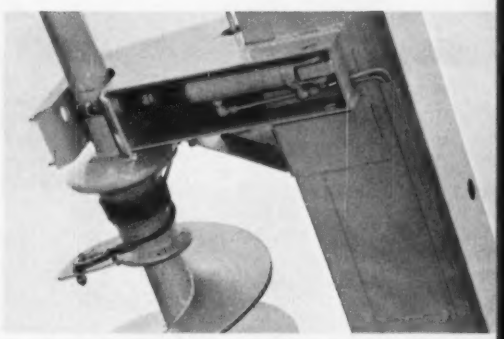
NOW ALL POLECAT™ MODELS FEATURE

UNI/DYNE TURRET™

BY PITMAN...

leader in development of new hydraulic lifting and digging equipment for electric utilities

Uni/Dyne Turret is standard in all Polecat models – center-mount, corner-mount, top-mount, as well as the new top-mount type which rotates operator right with the head-unit. Note Uni/Dyne's clean, uncluttered design, with entire rotation mechanism enclosed and running in a bath of oil. There are no exposed hydraulic lines to snag. Uni/Dyne Turret housing is of cast steel, stress-relieved, for far greater strength.



POLECAT FEATURES include this hydraulically-operated retaining pin (optional), which locks digger into carrying bracket along boom, after digger has reeled itself into position. Another exclusive mechanism automatically transfers digger head from main boom to extendible stinger. There are no exposed hydraulic hoses or fittings; no pressurized sliding tubes to leak; all hydraulic lines run within the boom.

OPERATOR RIDES right along with Uni/Dyne Turret on new top-mount Polecat, can sight along boom in any position. Turret rotates 375° in either direction, digs holes in a circle from 27′ to 42′ in diameter. Self-locking rotation mechanism provides rigid base for digging under toughest conditions, for lifting heavy loads precisely.

To see this remarkable machine in action, call your Pitman Utility Distributor for a thorough demonstration. Or, simply contact...

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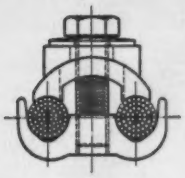
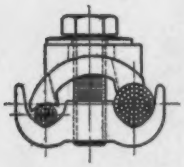
Diamond Chemicals

. . . in both grooves, because it is self-leveling. The TRIPLEX line of transformer tap connectors is the final result of intensive research by DOSSERT engineers. The TRIPLEX combines the efficient electrical properties of a parallel groove clamp along with a high dielectric strength polyethylene insulating cover to form an easy-to-install, completely insulated connector.



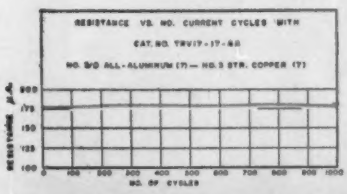


The TRIPLEX (type TRV) incorporates several unique features, that attribute to its high strength and extremely stable electrical characteristics.

1. A tangential plate, that receives the bolt clamping pressure and redistributes it uniformly over the arc of the clamping cap.

2. The tangential plate also establishes a flat surface perpendicular to the axis of the bolt for any combination of cable sizes. Perpendicularity is maintained even with connector holding a maximum cable in one groove and a minimum in the other.

3. To assure full clamping pressure during the thermal change caused by varying electrical loads, the connector has dish-shaped Belleville spring washers under the head of each bolt that permit expansion or contraction of the connector with constant spring loaded pressure on the clamping members.



TRIPLEX heat cycling test shows negligible change in resistance!

An established current level of 330 amperes drove the conductors to a minimum temperature of 125°C. The on-time was 20 minutes and the off-time 40 minutes. The curve shows negligible resistance change throughout the entire 1000 cycles.

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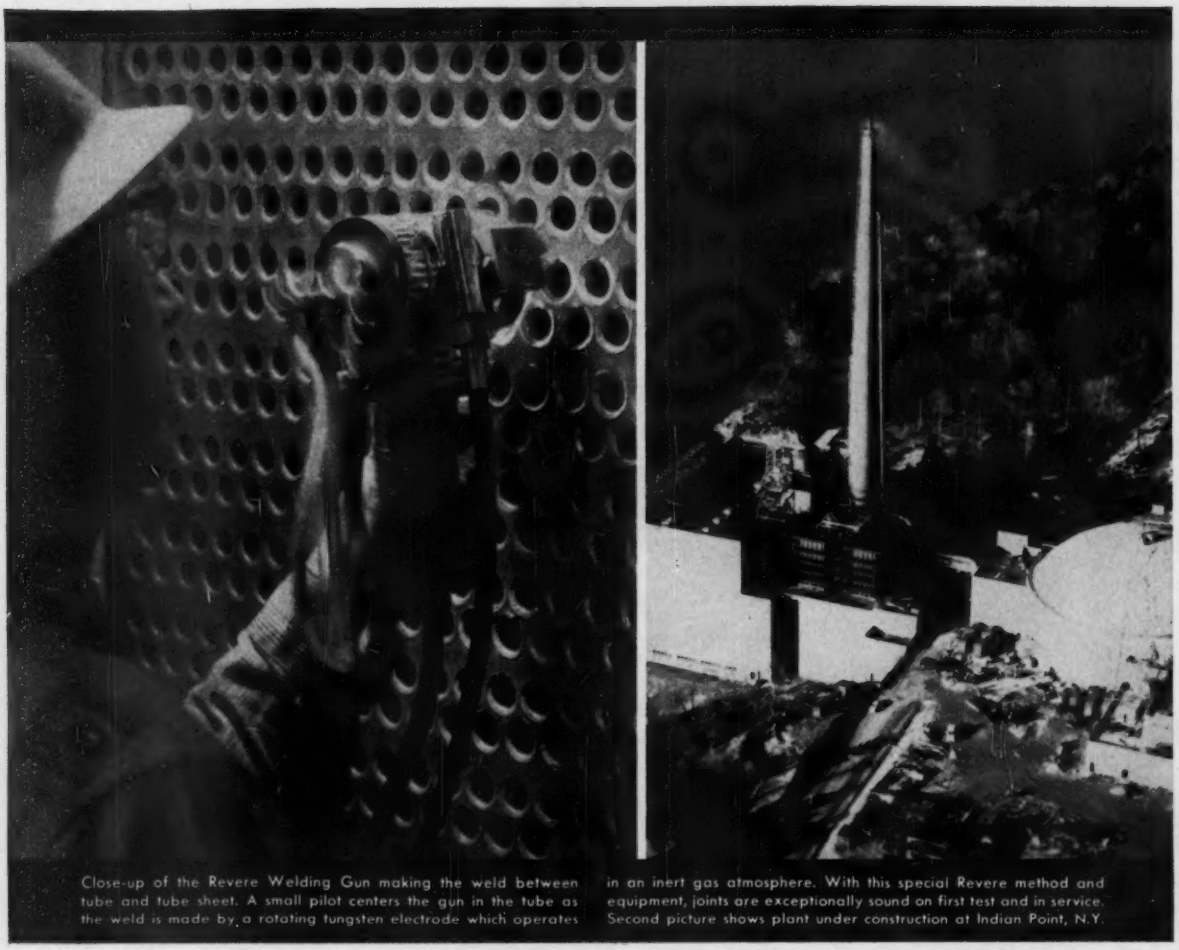


Close-up of the Revere Welding Gun making the weld between tube and tube sheet. A small pilot centers the gun in the tube as the weld is made by a rotating tungsten electrode which operates in an inert gas atmosphere. With this special Revere method and equipment, joints are exceptionally sound on first test and in service. Second picture shows plant under construction at Indian Point, N.Y.

HOW CONDENSER TUBES— AVOID CONTAMINATION

Revere Welding Gun* Used to Join 179 miles of Revere Tube to 8 Tube Sheets at Con Edison's Indian Point Atom-Powered 275,000 KW Unit

Later this year, Consolidated Edison will begin feeding power to its system from the $100,000,000 Indian Point, N. Y. generating plant, the largest atomic-fueled generating plant in America. An advanced type of Ingersoll-Rand Twin-Shell Surface Condenser serves this new 275,000 KW plant, and each of its thousands of Revere Condenser Tubes were *welded* into place, using the Revere Automatic Welding Gun.

Welding was used to assure absolute freedom from leaks between tubes and sheets—vital because of the low chloride requirements for the secondary water system at Indian Point.

This newest method of securing condenser tubes used techniques and equipment also used aboard the world's

*Pat. Pending

Integral Finned Tube • Bimetal Tube • Dual Gauge Tube • Instrumentation Tube • Condenser Tubes in Cupro-Nickel, Aluminum Brass, Admiralty, Herculoy (Silicon-Bronze), Arsenical Copper, Muntz Metal And Other Alloys • Aluminum Tube, Sheet And Extrusions • Small And Large Plates In Cupro-Nickel, Copper, Herculoy, Muntz Metal, Naval Brass And Admiralty • Low Carbon Steel Heat Exchanger Tube To ASTM Spec. A-214 And A-334 Grade "C" • Boiler Tube To ASTM Spec. A-178

Open end of one of the twin condenser shells shows Revere Admiralty Tubes inserted in Revere Herculoy (Silicon Bronze) sheets. (Above right) Worker seats a Revere Tube ready for welding. 31,508 tubes, totalling more than 179 miles were installed. Installation of condenser and tubes was made by CHAMPION CONSTRUCTION & ENGINEERING CO. INC., Long Island City 1, N. Y.

WELDED IN PLACE— AT NUCLEAR POWER PLANT

first nuclear-powered merchant vessel, the N.S. Savannah.

At Indian Point, 473,500 lbs. of Revere Admiralty Tubes, ⅞" O.D., 18 BWG X 30′ long are used; selected because this alloy best suits water conditions found at the site. These tubes are welded into 8 Tube Sheets fabricated of 1⅜" thick Revere Herculoy, the silicon bronze with the strength of mild steel and the corrosion-resistant properties of copper.

Revere Automatic Welding Gun Used

Each of the more than 60,000 joints between the tubes and the sheets were made using the Revere Welding Gun and Revere-developed techniques. As a result, sound leak-proof joints were produced.

Revere produces condenser tubes in all of the standard condenser tube alloys, in aluminum and aluminum alloys, and in welded carbon and stainless steels. Integral finned copper-base alloy tubes are also produced. Take advantage of these metals and Revere's experience by calling Revere today.

REVERE

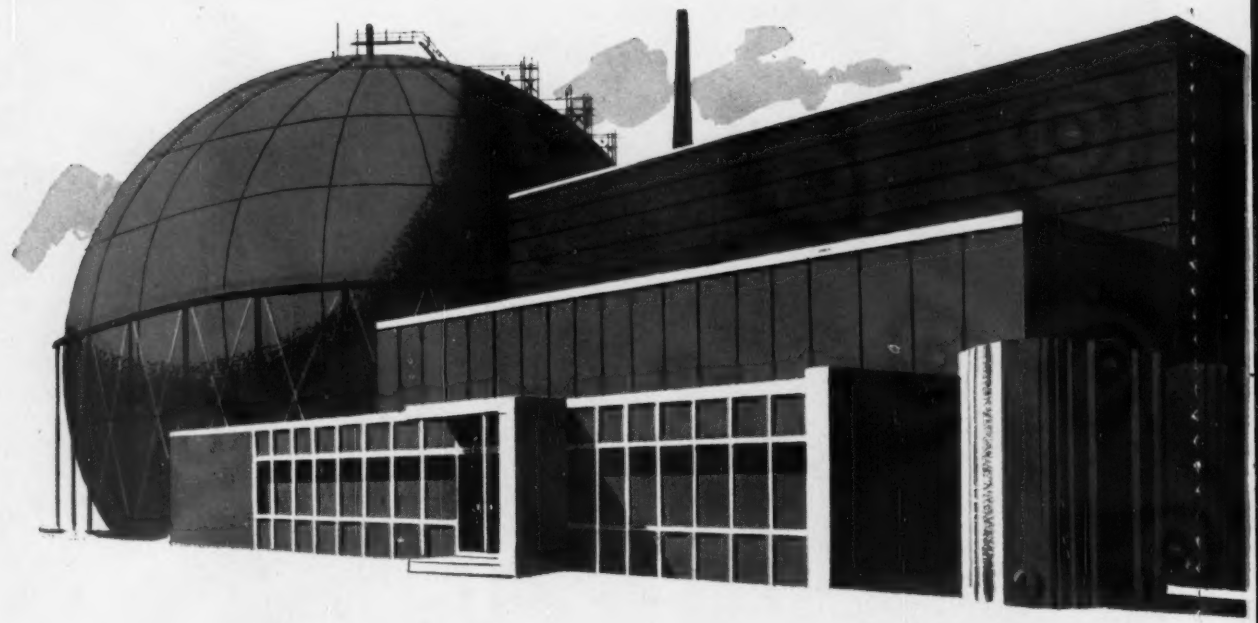
COPPER AND BRASS INCORPORATED

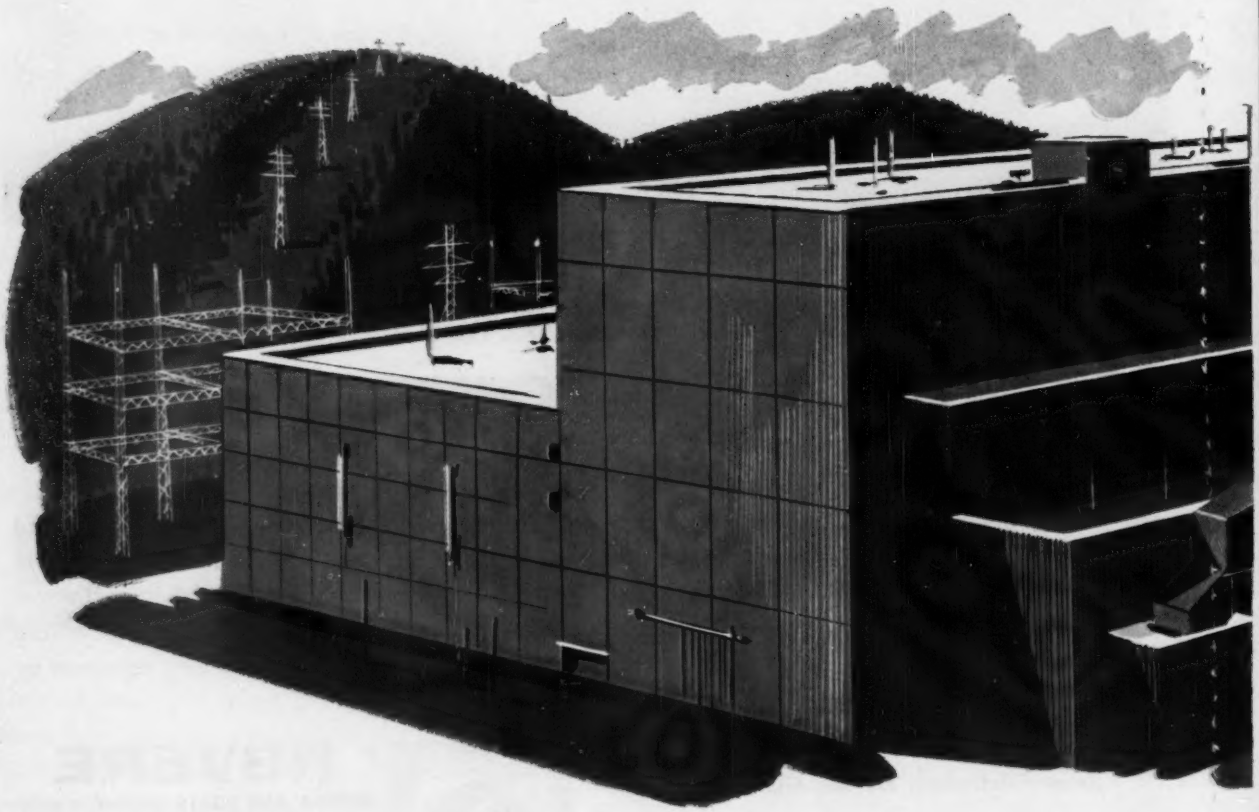
Founded by Paul Revere in 1801

Executive Offices: 230 Park Ave., New York 17, N. Y.

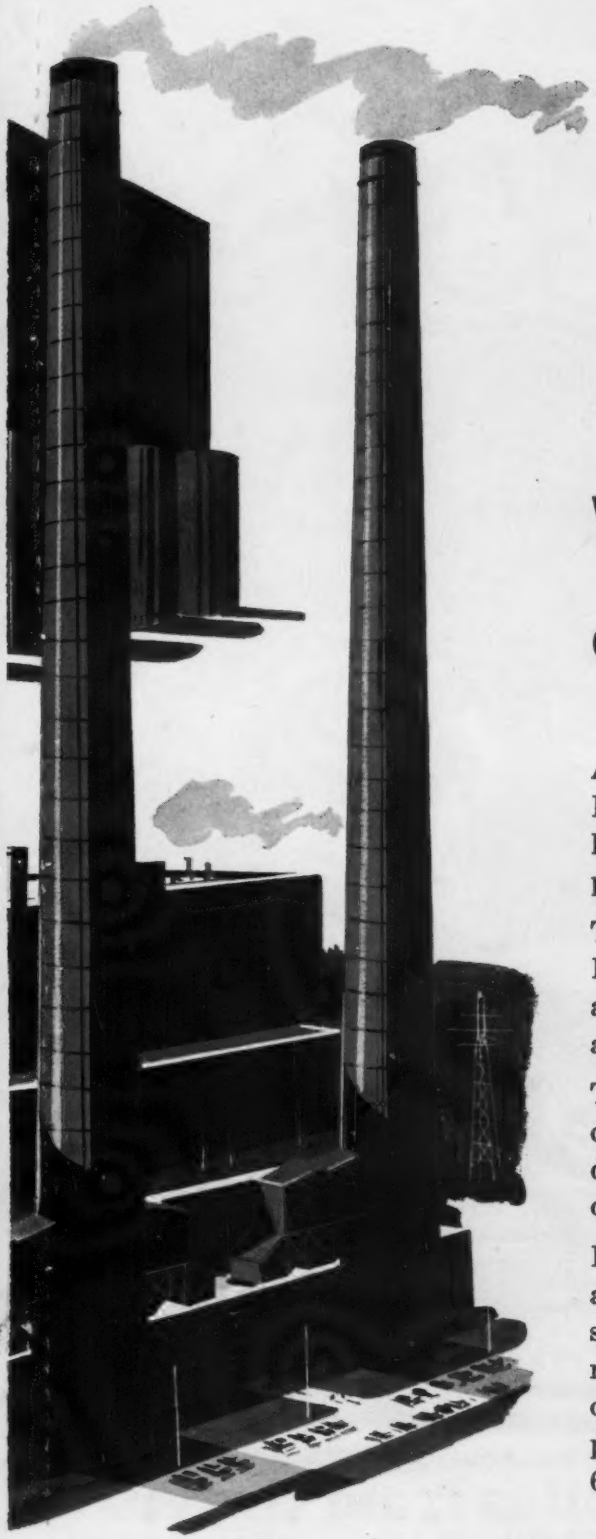
Mills: Rome, N.Y.; Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles, Riverside and Santa Ana, Calif.; New Bedford and Plymouth, Mass.; Brooklyn, N.Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities.

Distributors Everywhere





POWER PLANT PRODUCTS HEAT ENGINEERED BY FOSTER WHEELER:
Central Station and Industrial Steam Generators • Steam Condensers and Pumps • Cooling Towers
Pulverized Fuel Systems • Feedwater Heaters • Packaged Steam Generators • Nuclear Components



Whatever the challenge

Atomic power plants were not achieved overnight. In a large measure they were built on fundamental knowledge developed for conventional steam power plants.

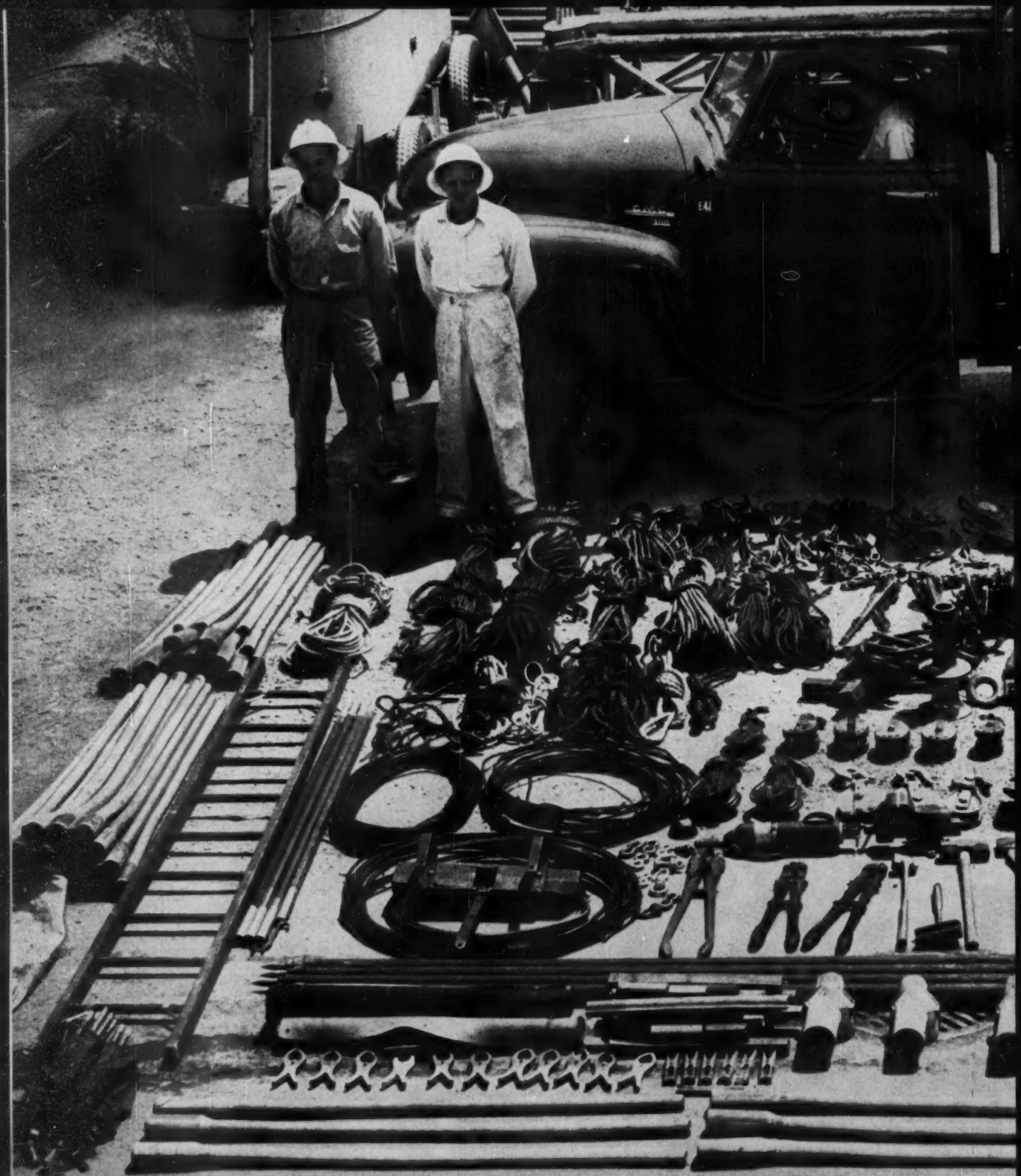
Thoroughly grounded in these fundamentals, Foster Wheeler has designed, engineered and built more nuclear steam generators than any other firm in the world.

Today, nuclear-born technology at Foster Wheeler contributes directly to superior equipment of every description . . . equipment that earns a better return on plant investment.

Foster Wheeler designs and builds utility, industrial and marine steam generators; pulverized fuel systems, steam condensers, feedwater heaters, nuclear components, cooling towers, pressure vessels, oil refineries; chemical, petro-chemical and industrial processing plants. Foster Wheeler Corporation, 666 Fifth Avenue, New York 19, New York.

FOSTER WHEELER

NEW YORK TORONTO LONDON PARIS MILAN TOKYO

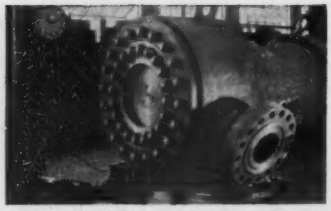


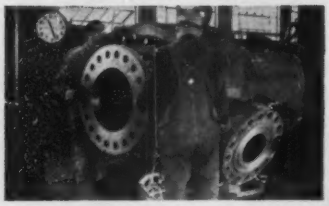
Ready to roll—with supplies from Graybar

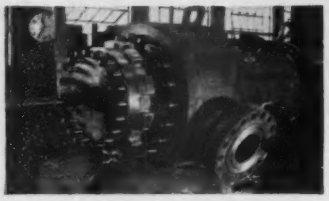
Keep your fleet ready for any service call, with all the supplies it needs—from hardware to wire and conduit. But don't tie up capital in do-it-yourself warehousing! Let your Graybar service center be your warehouse for service fleet supplies, as well as everything else electrical. ■ Prompt? We process your order the day we get it. And with your help—we can often deliver on the same day, too. Here's how: we work

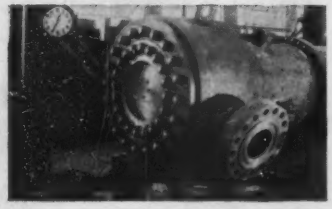
out with you a planned purchase program, in which we stock what you need at our expense—even if your requirements are unusual. Your own inventory is minimum, yet you get what you want when and where you need it. ■ So don't pay the cost of possession that's the penalty of an unbalanced inventory. See Graybar—for everything. Graybar Electric Co., Inc.: local service to utilities through coast-to-coast warehousing.

GraybaR

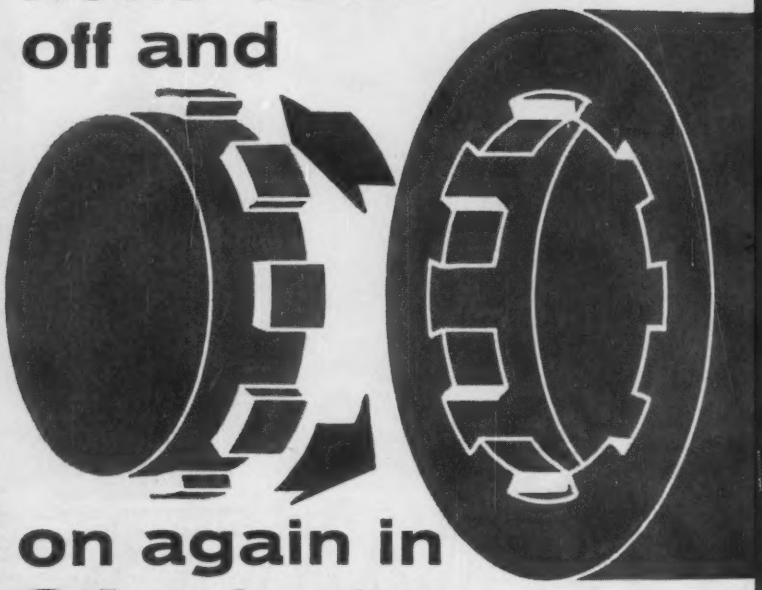








head cover off and



on again in 84 minutes

cuts feedwater heater inspection downtime

Periodic internal inspection of high pressure feedwater heaters is easy and fast with G-R Type "L" breech block heads. The complete operation of cover removal and reinstallation is shown in photographs at left.

When the cover is removed the entire tube sheet and all tube joints are readily accessible for examination and cleaning from outside the heater. No need to squeeze and squirm inside the water head whether heaters are large or small.

G-R Type "L" breech block high pressure heaters are available with all welded seals without gaskets, with rolled or rolled-and-welded tube joints.

More than 1,000 G-R heaters are installed operating at over 1,000 psi. More than 250 are in operation at pressures in excess of 3,000 psi. *This record is unsurpassed by any other American manufacturer.*

G-R high pressure heaters are available in all types and sizes, horizontal or vertical, and are furnished with suitable cover handling rigs.

Take advantage of G-R's extensive experience in the design and fabrication of Feedwater Heaters. There is a G-R representative in your territory ready to help you.

GRISCOM-RUSSELL / C. H. WHEELER

Massillon, Ohio — Philadelphia 32, Pa.

Affiliated sources for heat exchangers, closed feedwater heaters, deaerating heaters, evaporators, steam condensers, pumps, marine auxiliary equipment, sea water distillation plants, nuclear steam generators and related components.

With low-cost IBM 1620 Computer...

New England Electric's engineers solve 64-bus load flow study in 20 minutes

The New England Electric System got its desk-sized, IBM 1620 Data Processing System early this year. Since then, the engineering staff has freed itself from a mass of manual calculations...sharply increased creative output.

With the 1620, engineers now get complete answers to complex system design studies in a fraction of the time once required. For example, the computer solves a 64-bus load flow study in 20 minutes, turns out answers in printed form.

You'll find the low-cost IBM 1620 solves a wide range of problems in utility engineering design, system planning, and operations; it also handles studies too complicated to solve by other methods. Your IBM Sales Representative will be glad to give you all the facts.

An IBM 1620 went to work for New England Electric soon after delivery. Before installation, monthly seminars were held. Twenty engineers attended an intensive, one-week IBM school. Free IBM assistance sharply cut programming time and costs.

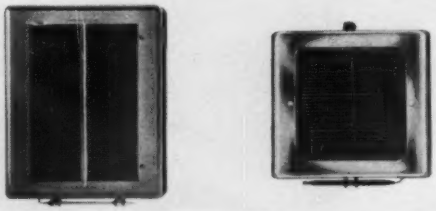
IBM®
DATA PROCESSING

®Electromode LEADER

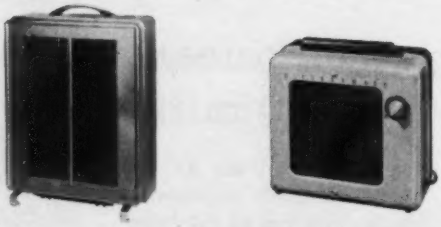
FLAMELESS electric heating units and systems comprise Electromode's one and only business. As a pioneer company in this field, our engineers have been able to concentrate their attention on producing heaters of highest quality, long life and maximum efficiency. There is no substitute for accumulated know-how in a specialized field. That is why Electromode can safely offer substantial guarantees on the quality of all its products. It is a principal reason for Electromodes rise to leadership in electric heating.

BASEBOARD

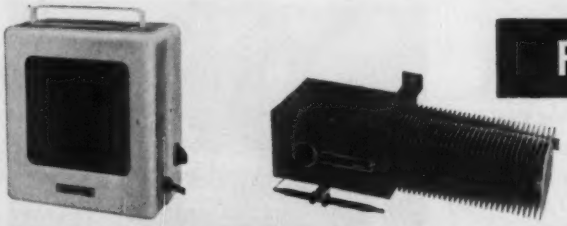
WALL MODELS



PORTABLES



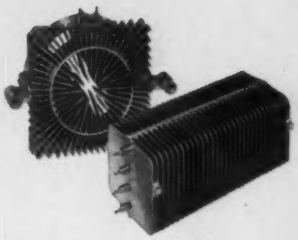
FARM HEATERS



Write today for complete literature and specifications on the world's most complete line of Flameless All-Electric heaters:

IN ALL-Electric HEAT

Another reason that underlines Electromode leadership is the one word—ALUMINUM. Electromode is the exclusive developer of the Solid Aluminum Safety Grid. Complete safety is assured because all heating elements are embedded deeply in a sheathing of cast aluminum—leaving no possibility of danger from fire, shock or burn. Also, aluminum is ideally suited for both conducting and radiating heat. No heat is lost. No heat is wasted. Result—Electromode provides total efficiency in electric heat!



Here is the ultimate word in heating for modern living. Classically slim Electromode low-level baseboard fits snugly against the wall, enhances the appearance of any room. Convection and radiant warmth is smoothly distributed at floor level—along outer walls and under windows. Comes in various lengths, with customized matching fittings and blank sections to carry out a continuous, pleasing baseboard effect in any size or shape room.

For space-saving convenience Electromode offers a wide variety of wall heaters in various sizes and capacities to suit the particular need of any room. Fan-circulated heat is uniformly distributed to every corner of the room, with individual temperature control for each room at the exact temperature you select. Manual control models or automatic thermostat types. Just set the dial and relax in comfort.

Electromode offers the widest choice of multi-purpose electric portable heaters on the market, all equipped with the exclusive 100% safe Solid Aluminum Heating Element. Whether or not your main source is electric heat, one or more Electromode portables are indispensable in your home. You'll find dozens of uses from attic to basement. Move it in a jiffy to where you want it, when you want it. A dependable Electromode heater is your ever-ready solution to erratic heating problems.

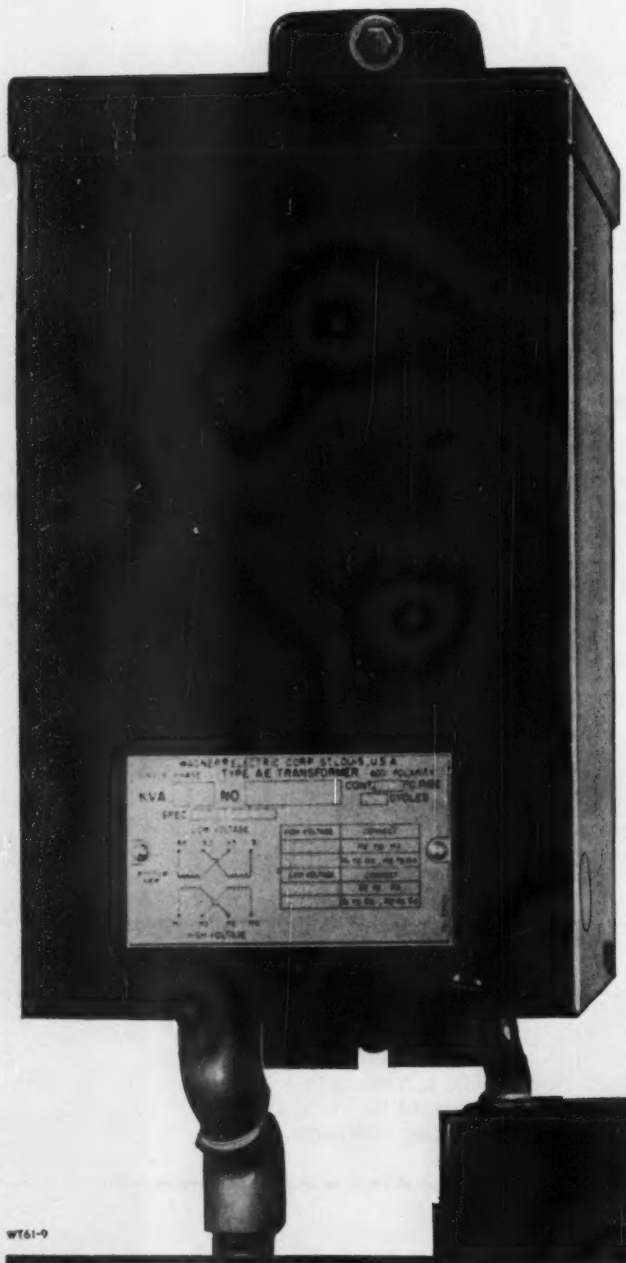
When it comes to farm heaters, Electromode offers a variety of specially-designed units that translate more comfort and convenience into greater efficiency and profit for the modern farmer—all around his farm. There is a perfectly adapted heater for every farm purpose: milk house, pump house, storage bins, brooding pens and many other locations. Send for Electromode's free farm unit folder.

ELECTROMODE *division of Commercial Controls Corporation* **ROCHESTER 3, N.Y.**

WAGNER® DRY-TYPE GENERAL PURPOSE TRANSFORMERS

Compact Epoxy-Filled Units that

WHISPER WHILE THEY WORK



Unusually small in size (the 10 kva rating is less than a foot-and-a-half high), Wagner® totally-enclosed Type AE Single Phase Transformers can be used for general purpose applications. They have a low sound level, the result of encasing small Wagner Form W core and coils in a solid block of epoxy compound . . . to give you a whisper-quiet transformer that can be used anywhere noise would be a nuisance.

Available in ratings from 1 to 10 kva, Wagner Type AE Transformers have insulation protection suitable for continuous operation at 80°C in a 30°C average ambient. All parts are sealed from dust, moisture, and corrosion by the epoxy compound. Every unit is built to conform to all applicable standards of ASA and NEMA.

Wagner Type AE Transformers can be installed indoors or out in any location where they will not be submerged or exposed to injurious fumes in concentration. Compact and lightweight, they require no fireproof vaults and can be mounted indoors in any position, at any angle, on wall, floor, or ceiling. These transformers are carried in stock at Wagner branches and distributors. There's one near you, listed in your 'phone book. Call or write now.

Wagner Electric Corporation
6456 PLYMOUTH AVENUE, ST. LOUIS 33, MO., U.S.A.

WT61-9

SPECIFICATIONS

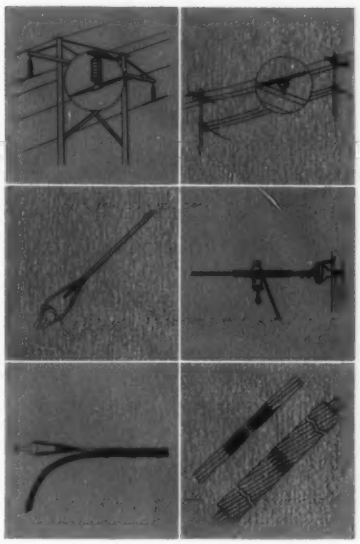
Type AE—Single Phase—1 to 10 Kva 80° C Rise, 60 Cycles.

High Voltages: 120 x 240; 240 x 480; 600 volts, no taps; 480, 600 volts, 2—5% taps below normal.

Low Voltage: 120/240 volts.

KVA	DIMENSIONS IN INCHES			NET WEIGHT POUNDS	AVERAGE SOUND LEVEL DECIBELS
	Height	Width	Depth		
1	10 13/16	6 5/16	6 5/16	28	37
1½	11 13/16	6 5/16	6 5/16	34	38
2	13 1/16	6 13/16	7 3/16	46	38
3	14 1/16	6 13/16	7 3/16	62	39
5	15 5/16	9 3/4	9 1/4	93	39
7½	16 1/16	9 11/16	10 7/16	130	39
10	17 1/16	11 1/16	10 1/4	167	39

FANNER Superformed* PRODUCTS



ARMOR RODS
. . . Protect long spans at supports

LINEGUARDS
. . . Protect short spans at supports

FANNGRIPS
. . . For dead-ending strands or conductors

TAP ARMOR
. . . Protects conductor at tapping points

LASHING RODS
. . . For lashing covered conductors to messenger strand

FANNSPLICES ARMOR SPLICES
. . . For joining, splicing or restoring conductors or strands

All available for all conductor types, metals and sizes

SUPERFORMING IS A MANUFACTURING PROCESS USING EQUIPMENT RESEARCHED • DEVELOPED • PATENTED • MANUFACTURED ONLY BY:

WORLD'S FIRST MAKER OF MACHINE-FORMED ARMOR RODS... **FANNER** ➤

*A superior forming method in accordance with Patents No. 2,769,478 and/or 2,588,663—other patents applied for.

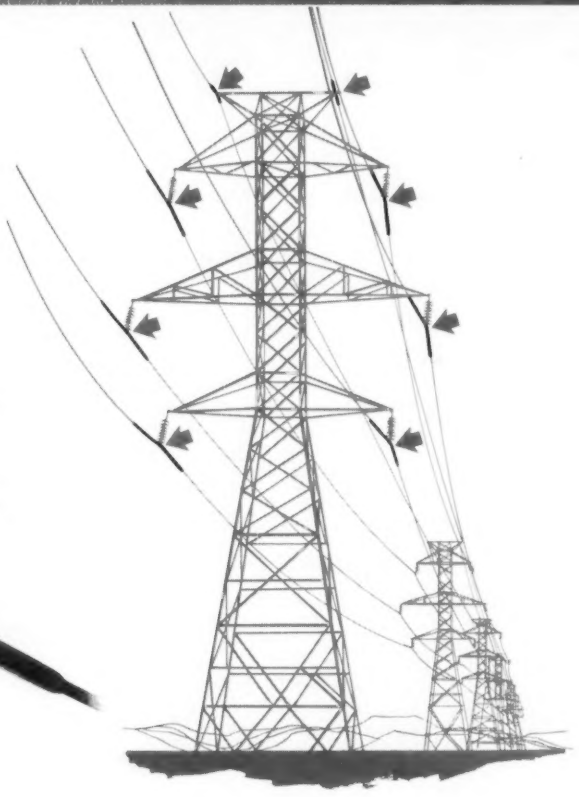
All lines need... **PROTECTION**

Over the years . . . in test after test, on job after job, FANNER SUPERFORMED PRODUCTS have demonstrated superiority as T&D-line holding-protecting devices . . . and for numerous other uses, such as dead-ending, tapping, lashing, splicing and patching.

Why? The *exclusive Fanner Superforming* method. EXCLUSIVE and *patented*. Superforming assures uniformly high quality, lasting dimensional accuracy, unmatched strength. No other forming process can equal it for performance results. Your FANNER MAN will tell you why.

PROTECT *your long spans at these vulnerable points*

...with FANNER Superformed* ARMOR RODS



- Bolster conductor strength
- Multiply conductor life
- Provide enduring protection against damage from:

Vibration • Flexure • Flashover • Chafing • Clamping

The *only* holding-protecting devices that provide *all* these advantages

NO CONCENTRATED STRESS . . . uniform all-metal support, no "rubbery" spots

NO PERFORMANCE VARIATIONS . . . applications always uniform

NO FLAWS . . . rod components have smooth surfaces, uniform internal structure

NO CORONA INDUCEMENT . . . rod ends smoothly machined

NO LOOSENING . . . wear, aging, creeping or slipping

NO RE-SAGGING PROBLEM . . . adjustment possible after application

NO TOOLS . . . easy, fast application by hand

*A superior forming method in accordance with Patents No. 2,769,478 and/or 2,588,663—other patents applied for.

THE FANNER MANUFACTURING COMPANY
Brookside Park • Cleveland 9, Ohio

DIVISION OF TEXTRON, INC.

Fine Fanner Superformed Products

A-5883A

What's the real score on 4x4's?

FORD 4x4 PICKUPS GIVE YOU MORE!!!

Ford 4-wheel drive sales have increased 54% in the last three years! And with good reason. Here's how the six-cylinder Ford ½-tonner compares to another reasonably priced 4 x 4 pickup. Ford gives you: **28% MORE HORSEPOWER** with modern valve-in-head, short-stroke Six. Here's reserve lugging power to make jobs easier, plus gas-saving economy. **84% STRONGER FRAME RAILS** to take rugged off-road work in stride. The Ford frame has a 4.74 section modulus for extra rigidity and strength. **23% MORE CLUTCH FRICTIONAL AREA** on Ford's heavy-duty 11-inch clutch. And semi-centrifugal design provides greater torque-transmitting capacity as the engine speed increases. **99% MORE LOADSPACE** in Ford's sturdy 8-foot Styleside Pickup box. A full 70.6 cubic feet of cargo area for bulkiest loads. **50% MORE FRONT AXLE CAPACITY** for greater durability. Ford's axle is rated for an extra 1,000 pounds!

NOW, YOU CAN KEEP YOUR FLEET ALL FORD with Ford all-wheel drive trucks, too!

FORD TRUCKS COST LESS

SEE YOUR FORD DEALER'S "CERTIFIED ECONOMY BOOK" FOR PROOF!

FORD DIVISION, Ford Motor Company

HUBBARD

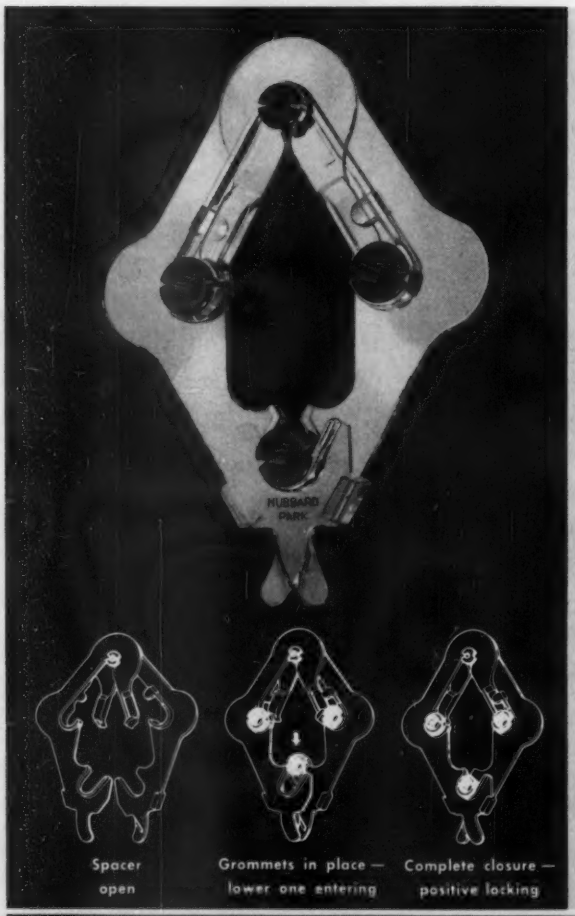
AERIAL CABLE HARDWARE AND SPACER

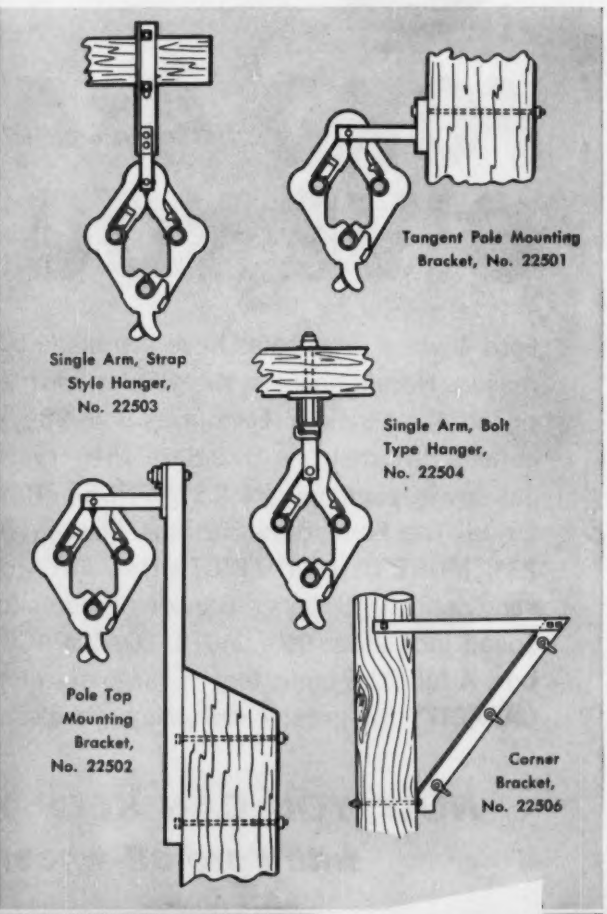
...perfect for all aerial cable systems

You can save money and time by installing Hubbard Aerial Cable Hardware if you are using aerial cable construction.

MONEY — because *without* the use of bolts, clamps, keepers or tie wires, Hubbard-Park Plexiglas spacers completely enclose and positively lock cables and messenger on 6-inch centers. Polyethylene grommets are available for all standard cable sizes.

TIME — because Brackets and Spacers are easily and quickly installed and procured from the same source. Brackets are designed for any mounting conditions as shown by sketches at the right.



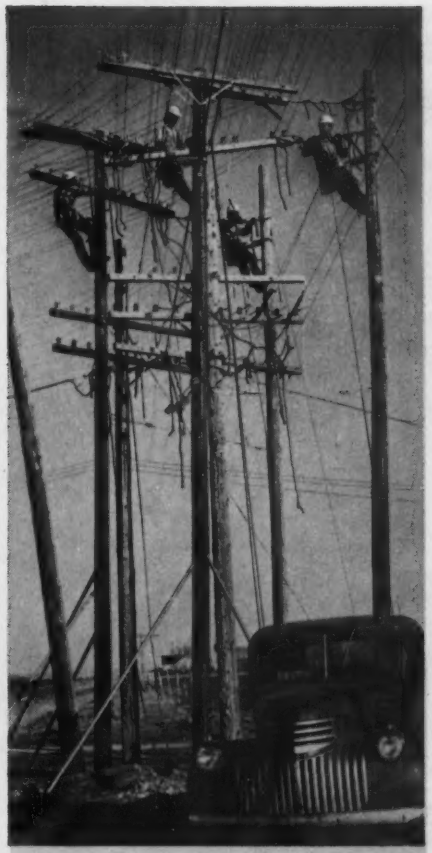

Tangent Pole Mounting Bracket, No. 22501
Single Arm, Strap Style Hanger, No. 22503
Single Arm, Bolt Type Hanger, No. 22504
Pole Top Mounting Bracket, No. 22502
Corner Bracket, No. 22506

BETTER PRODUCTS *through Creative Engineering*

HUBBARD

AND COMPANY • 5401 ROOSEVELT ROAD • CHICAGO 50, ILLINOIS

The complete line of Hubbard Aerial Cable Hardware is available from stock for immediate shipment.



Planned maintenance can delay for many years the expense of placing new poles.

HOW TO KEEP STANDING POLES STANDING LONGER

Three keys to an effective preventive maintenance program

Because of the continually mounting expense of setting new poles and transferring fixtures, there is no longer any doubt of the value of planned pole maintenance. Experience of utilities pioneering such work proves that supplemental preservative treatments will extend pole life many years . . . stretching maintenance dollars and deferring capital expenditures.

Success of such a program is dependent upon: 1) Regular and thorough inspections of standing poles. 2) Treatment as necessary with preservatives designed for this specific purpose. 3) Keeping accurate records of inspections and treatment.

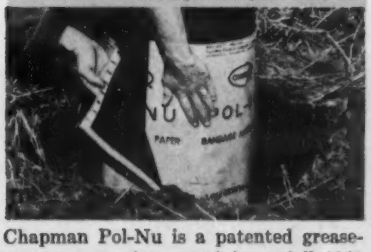
The most widely used preservative products for pole maintenance are manufactured by Chapman Chemical Company. They contain pentachlorophenol, the superior wood preservative which gives proven results in preventing decay and insect attack.

With specific products for pole maintenance needs and broad experience in this field, Chapman can help you establish a complete program to insure best results at least expense.

USE THESE CHAPMAN PRODUCTS FOR SUCCESSFUL POLE MAINTENANCE

Pol-Nu® Preservative and Bandage-Maker

Pull out Pol-Nu bandage...wrap around pole.



Chapman Pol-Nu is a patented grease-type preservative containing a full 10% pentachlorophenol in solvent oils which meet AWPA specifications. It gives excellent penetration, is not water soluble. Pol-Nu is used for ground-line treatment and to prevent decay in checks and cracks above ground.

The Chapman Pol-Nu Bandage-Maker is a unique, portable device which prepares ground-line treatment bandages in the field. It insures a uniformly accurate Pol-Nu preservative application on every pole that is treated.

Pol-Nu Pak

Convenient ground-line treating bandage containing Pol-Nu. Factory-sealed envelope insures proper amount of preservative, is easy to apply. Handy for spot treating and "change-outs" as well as full-line treatment.

Pol-Kap and Applicator

The Pol-Kap is a permanent preservative topping for poles which seals out moisture and releases pentachlorophenol into wood to kill decay. Easily, safely applied with special applicator which locks on end of hot stick.

Penta Plus 40

Oil solution of pentachlorophenol for full-length pole and cross-arm spraying, and brush or soak treatments at retirement yards. Penta Plus 40 restores preservative protection economically.

CHAPMAN®

CHAPMAN CHEMICAL COMPANY

Leading manufacturer of wood preservatives

Memphis 1, Tenn.

Mail coupon for information

Chapman Chemical Company
P. O. Box 136, Memphis 1, Tenn.

Please send complete information on products for pole maintenance to:

Name_____

Company_____

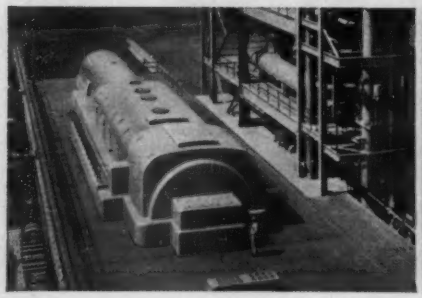
Address_____

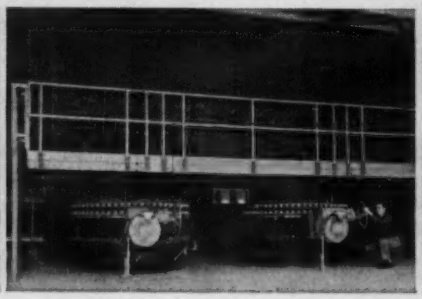
Allis-Chalmers sets the pace

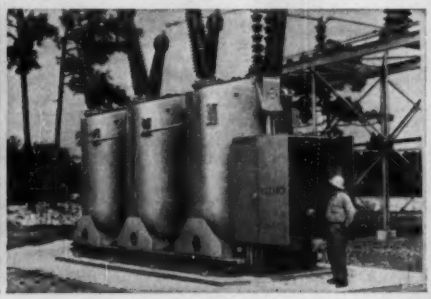
Giant 300,000-hp reversible pump-turbines, such as the A-C units at Taum Sauk, would have staggered the imaginations of water power engineers of World War One years. Then, A-C commercial plant capacities ranged from 10 to 10,000 hp. Even as recently as 5 years ago, 150,000-hp hydroelectric units were considered by the industry to be approaching the largest size economically feasible.

Major new water-power developments at A-C promise still further advances in pump-turbine design, power and efficiency to help conserve our national resources.

Such A-C design progress has always been keyed to anticipate utilities' needs. A recent example is the highest rated (404,250 kva) transformer installed to date — supplied by Allis-Chalmers. Another A-C development is the new voltage capacitor control. It uses an inductive pickup to eliminate the current transformer, and to cut installing time 50%.





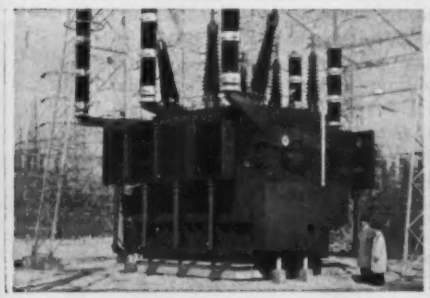


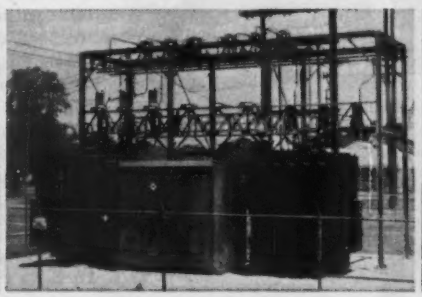
for hydraulic turbine progress

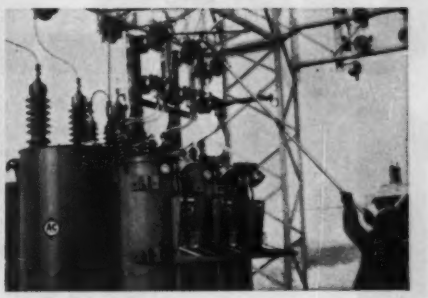
These and other A-C technical advances are aimed at assisting America's utilities in maintaining their remarkable record for generating, transmitting and distributing low-cost power. Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-1524





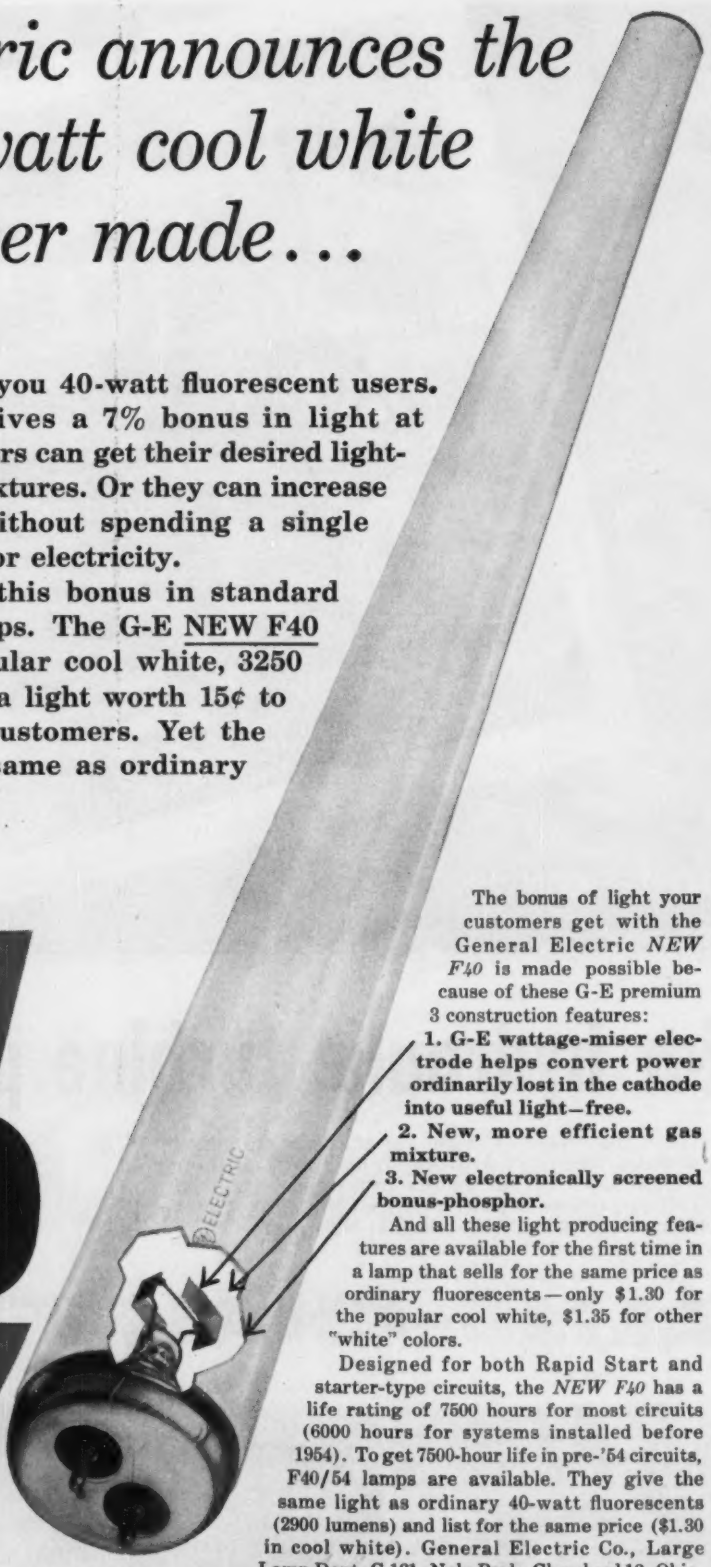


General Electric announces the brightest 40-watt cool white fluorescent ever made...

Here's money-saving news for you 40-watt fluorescent users. General Electric's NEW F40 gives a 7% bonus in light at no extra cost. Now your customers can get their desired lighting level with fewer lamps and fixtures. Or they can increase their existing lighting level without spending a single extra penny for lamps, fixtures or electricity.

Only General Electric offers this bonus in standard 40-watt "white" fluorescent lamps. The G-E NEW F40 is rated at 3100 lumens in popular cool white, 3250 in white or warm white—extra light worth 15¢ to 30¢ a lamp to most of your customers. Yet the list price for this lamp is the same as ordinary fluorescents.

NEW F40 ONLY 1.30 LIST



The bonus of light your customers get with the General Electric *NEW F40* is made possible because of these G-E premium 3 construction features:

1. G-E wattage-miser electrode helps convert power ordinarily lost in the cathode into useful light—free.

2. New, more efficient gas mixture.

3. New electronically screened bonus-phosphor.

And all these light producing features are available for the first time in a lamp that sells for the same price as ordinary fluorescents—only $1.30 for the popular cool white, $1.35 for other "white" colors.

Designed for both Rapid Start and starter-type circuits, the *NEW F40* has a life rating of 7500 hours for most circuits (6000 hours for systems installed before 1954). To get 7500-hour life in pre-'54 circuits, F40/54 lamps are available. They give the same light as ordinary 40-watt fluorescents (2900 lumens) and list for the same price ($1.30 in cool white). General Electric Co., Large Lamp Dept. C-121, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

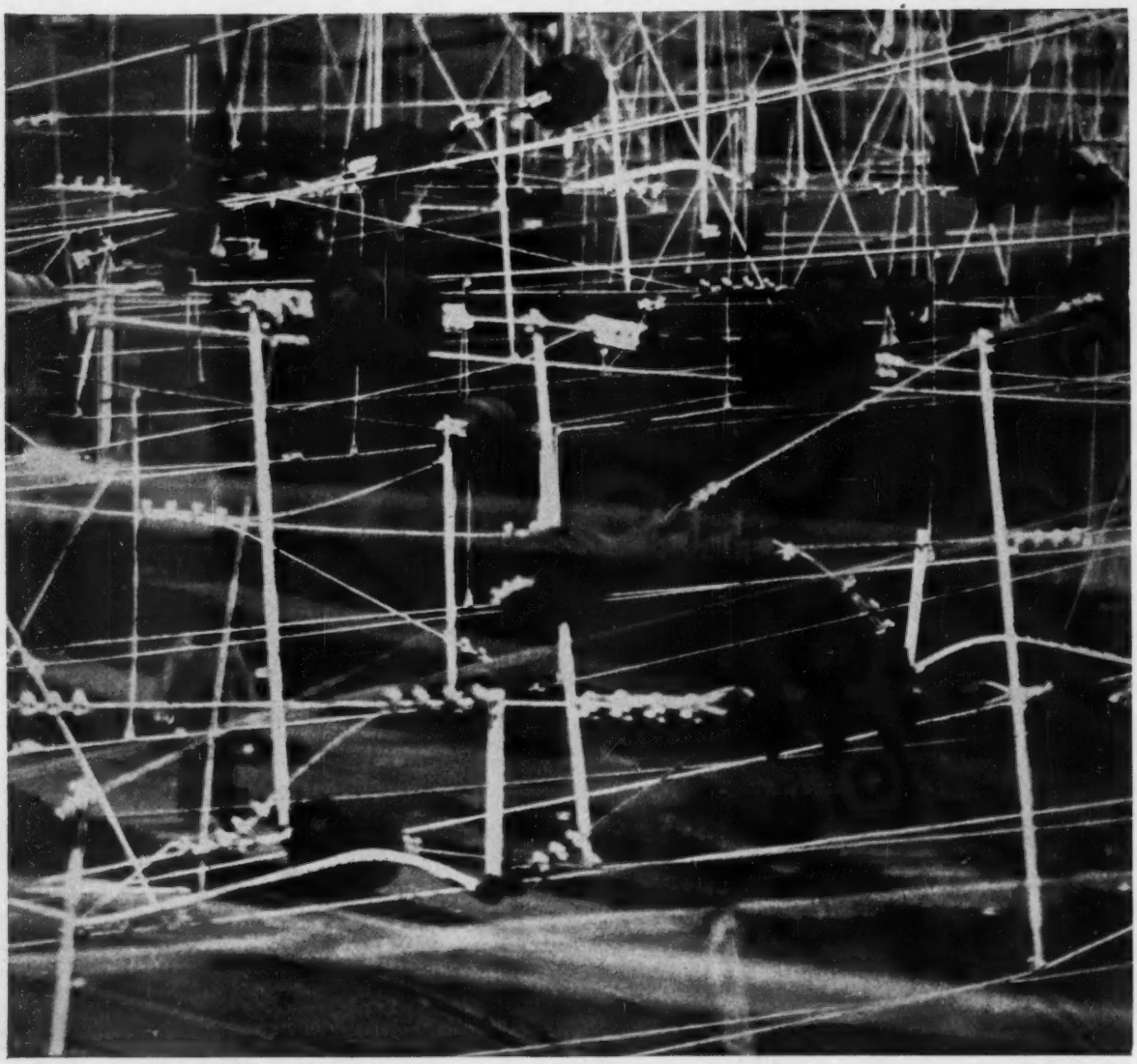
GENERAL ELECTRIC

Aluminum Landmark.

This sleek-looking transmission tower was developed, with assistance from Olin Aluminum, by Alrectic Division of McGraw-Edison Company and a leading utility in the Mid-South. This unique tower is fabricated by Alrectic of specially extruded members welded together. The design required selected alloys and new fabricating techniques; these were part of Olin's special contributions. It was designed for neighborhood use in tapered octagonal construction. And there's a bonus: this tower weighs 70% less than a steel tower and 90% less than one of concrete. Its strength is 12% greater than required standards. And, of course, being aluminum, it never needs painting. That's two big savings: reduced handling and labor costs and lack of maintenance. It's a great working example of how a manufacturer (and a community) can benefit from working with Olin Aluminum's research staff. More and more, manufacturers who want to incorporate new designs with extra savings, think in terms of aluminum. And more and more Olin Aluminum's research and marketing thinking have proved to be the most profitable answer to many a manufacturer's problem. Don't you think it would be a good idea to call your Olin Aluminum Sales Office or your local Distributor for creative, marketing, and production help?

McGraw-Edison products are marketed by Line Material Industries

Olin
ALUMINUM
400 PARK AVE., NEW YORK 22, NEW YORK



Where will you get new capital for the power-hungry '60s?

The privately owned electric utility industry plans to spend $4.93 billion on new and improved facilities in 1961. And over the next five years it expects to spend almost 10% more on expansion than it has in the past five.

As a vital, creative link between the electric utility industry and money sources, Kidder, Peabody has long experience and leadership in raising debt and equity funds through private placements and underwritings.

Last year, we managed or co-managed the underwriting, sale and distribution to the public and to institutions of 32 new utility issues amounting to more than $214,000,000.

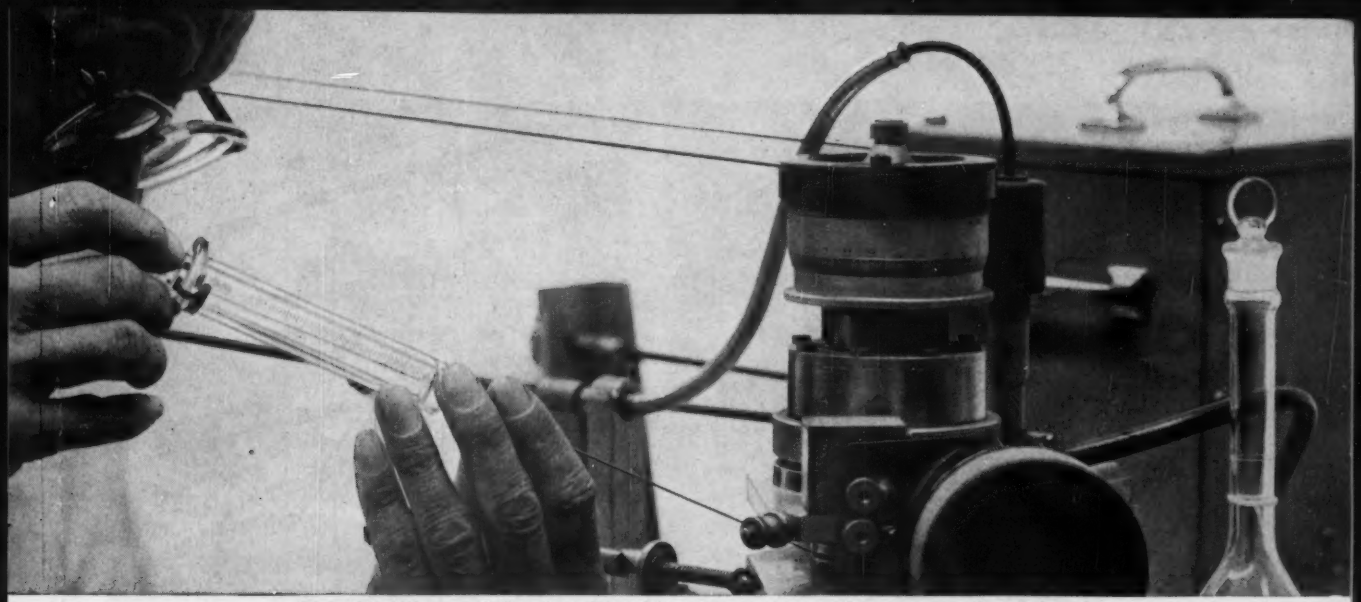
Our 27 offices coast-to-coast have the extensive contacts and facilities needed for prompt, economical distribution of new issues. Our experience and long-established connections with private and institutional investors bring us, every year, large quantities of private placement business. Call or write us for detailed information on how we could help your company meet its requirements for additional capital. Offices in New York, Boston, Philadelphia, Chicago, Los Angeles, San Francisco. Members New York, American, Boston, Philadelphia-Baltimore, Midwest and Pacific Coast Stock Exchanges.

Kidder, Peabody & Co.

FOUNDED 1865

17 Wall Street, New York 5, N. Y.

A partial listing of recent issues: *Alabama Power Company · Atlanta Gas Light Company · Brockton Edison Company · California Electric Power Company Carolina Power & Light Company · Central Hudson Gas & Electric Corporation · Central Louisiana Electric Company, Inc. · Community Public Service Company Delaware Power & Light Company · Fall River Electric Light Company · Florida Power Corporation · Florida Power & Light Company · Georgia Power Company Idaho Power Company · Interstate Power Company · Kansas Gas & Electric Company · Louisiana Power & Light Company · Maine Public Service Company Missouri Public Service Company · New York State Electric & Gas Company · Pacific Power & Light Company · Pennsylvania Electric Company · Public Service Company of New Hampshire · South Carolina Electric & Gas Company · Southern Nevada Power Company · Tampa Electric Company · Texas Power & Light Company · Upper Peninsula Power Company · Washington Water Power Company · Wisconsin Power & Light Company*



Diala Oil AX is carefully injected into laboratory equipment that measures electrical properties of the oil. This is one of the ways Shell makes sure that dielectric strength is high.

BULLETIN:

Shell reveals how Diala Oil AX lasts up to 5 times longer than ordinary oils

Only an oxidation-inhibited transformer oil of exceptional quality can be expected to give long service life under today's severe operating conditions.

That's why a growing number of utilities are switching to Shell Diala Oil AX. Read how Diala® AX helps them hold costs down—and how it can do the same for you.

THE DISTRIBUTION transformer is of constant concern to most utilities. It often operates outside its rated capacity during peak periods. Temperatures run high. And transformer maintenance costs are on the rise.

All of these factors have prompted utilities to search for a stable transformer oil that can help protect overloaded equipment, extend transformer life and reduce maintenance.

The answer for many utilities: Shell Diala Oil AX.

What Diala does

Diala AX contains a special Shell-developed oxidation inhibitor.

Accelerated laboratory oxidation tests show that Diala AX can provide satisfactory service *up to five times as long as* uninhibited oils.

Because of the oxidation inhibitor in Diala AX—and also because of Shell's selected base stocks and refining techniques—this remarkable transformer oil is exceptionally stable. It resists sludge formation. It helps prevent the creation of metal-attacking acids. And it reduces peroxide build-up which can damage many types of insulating materials.

Diala AX has also demonstrated an ability to extend the life of fabric insulation materials. In Shell's Emeryville, California laboratory, scientists soaked cotton insulating threads in many different oxidized oils—and for varying periods.

Conventional oils, when oxidized, weakened the thread by 25 to 40%. When subjected to the same oxidizing treatment, Diala AX had negligible effect on the thread's strength.

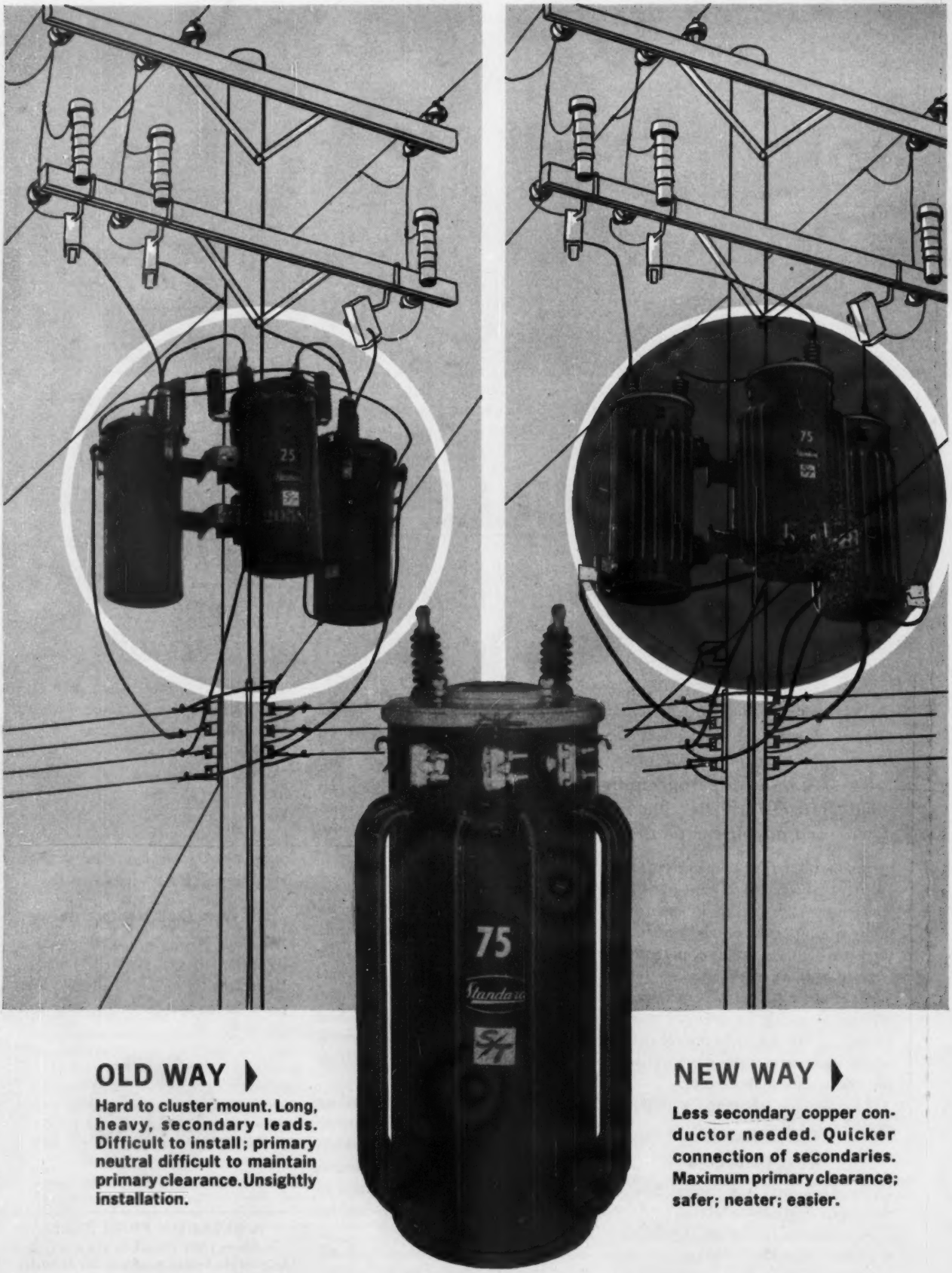
Diala AX has excellent dielectric properties (see photo above), good heat transfer characteristics and a very low pour point. Its low volatility reduces evaporation loss. And its flash point is high for maximum safety.

Call your Shell Representative

Ask your Shell Industrial Products Representative for all the facts on Diala AX. Or write: Shell Oil Company, 50 West 50th Street, New York 20, N. Y.

SHELL

A BULLETIN FROM SHELL
—where 1,997 scientists are working to provide better products for industry



OLD WAY ▸

Hard to cluster mount. Long, heavy, secondary leads. Difficult to install; primary neutral difficult to maintain primary clearance. Unsightly installation.

NEW WAY ▸

Less secondary copper conductor needed. Quicker connection of secondaries. Maximum primary clearance; safer; neater; easier.

another *Standard* first!

increased safety, lower installation costs, improved appearance for systems 2.4 KV through 14.4 KV

Standard continues to bring practical innovations to the nation's utilities first. This new, pole-type distribution transformer solves operating problems. The unit has cover-mounted bushings radially oriented from the pole and low voltage bushings located at the base of the transformer.

High voltage leads are away from the pole; secondaries are as far as possible from high voltage leads; less heavy wire is required in the secondary leads.

Here's a unit that's safer, neater, easier to install and maintain, and the shorter secondary leads weather harsh weather better. It saves money... saves time... looks better.

Is it right for your system? Check it out with your nearby Standard representative. He's ready with the facts.

Standard Transformer CO.

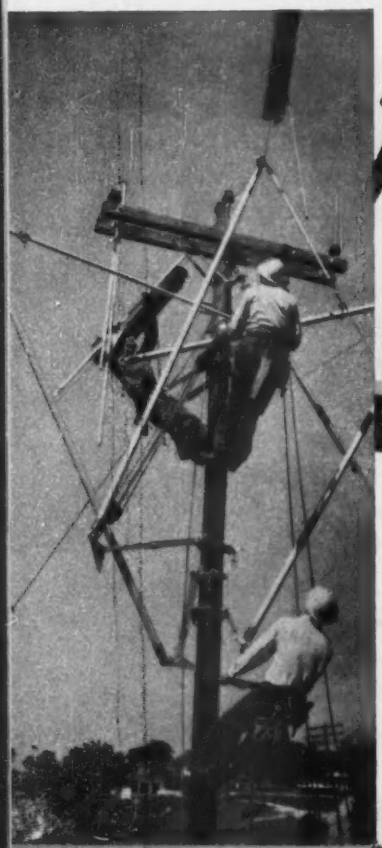
WARREN, OHIO

Phone:
EXpress 2-1563

"WHEREVER THERE IS POWER"

Kearney Hot Line Tool Demonstrators offer line crews new ideas and methods to...

SAVE MAN-HOURS...PREVENT ACCIDENTS...

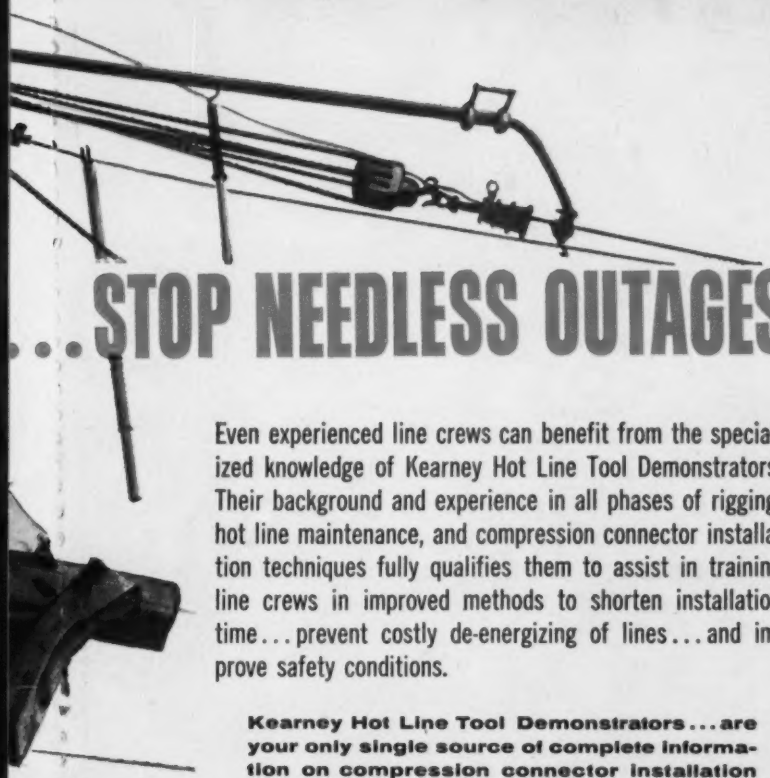


"IF YOU CAN INSTALL IT COLD... YOU CAN INSTALL IT HOT!"

Kearney Hot Line Tool Demonstrators prove the truth of the above statement day after day . . . by demonstration on actual live-line maintenance jobs. Through such demonstrations line crews learn proper safety procedures and time-saving, cost-cutting methods to make their job of maintaining energized lines easier and safer.

"On the job" demonstrations help solve spot problems and introduce new methods to line crews which can be used to advantage over and over again . . . to reduce costs, insure reliable operation and improve safety standards.

"We teach something, we learn something . . . everytime out"... says Clete Brewer, Chief of Kearney Demonstrators. This sums up the attitude of Kearney men in the field, explains why they are well-regarded by line crews everywhere.



...STOP NEEDLESS OUTAGES

Even experienced line crews can benefit from the specialized knowledge of Kearney Hot Line Tool Demonstrators. Their background and experience in all phases of rigging, hot line maintenance, and compression connector installation techniques fully qualifies them to assist in training line crews in improved methods to shorten installation time... prevent costly de-energizing of lines... and improve safety conditions.

Kearney Hot Line Tool Demonstrators... are your only single source of complete information on compression connector installation and hot-line maintenance techniques!

Kearney... and only Kearney... manufactures both a complete line of hot stick tools **and** a complete line of compression connectors, tools and dies. The completeness of these two lines is part of Kearney's planned program to provide power companies with a fully integrated selection of equipment to safely accomplish any phase of hot line work... without interruption of circuit continuity or service to customers.

If you would like to arrange for Kearney Demonstrator Service consult your Kearney Sales Representative. Adequate advance notice is necessary, of course, to permit proper planning and scheduling.

KEARNEY

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue • St. Louis 10, Missouri

PLANTS AT: ST. LOUIS • MELROSE PARK, ILLINOIS • FAYETTEVILLE, ARKANSAS
GUELPH, ONTARIO, CANADA • ST. THERESE, QUEBEC, CANADA

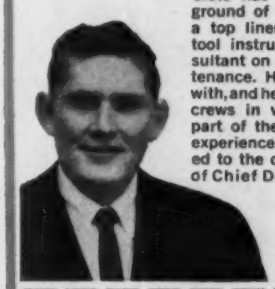
913

Hot stick schools conducted by Kearney Hot Line Tool Demonstrators keep linemen up to date on new installation and maintenance methods... new tools and equipment... new rigging techniques... and new ideas being used to advantage by line crews in other areas.

Chief Demonstrator Clete Brewer and his staff...

... cover the country. Kearney Demonstrators are available for help in training line crews or for consultation relating to specific job problems anywhere in the U. S. Each man is a well-qualified veteran with many years of past experience as a top lineman.

Chief Demonstrator Clete Brewer



Clete has a wide background of experience as a top lineman, hot line tool instructor and consultant on hot line maintenance. He has worked with, and helped train, line crews in virtually every part of the country. His experience is ideally suited to the demanding job of Chief Demonstrator.

CARL JONES

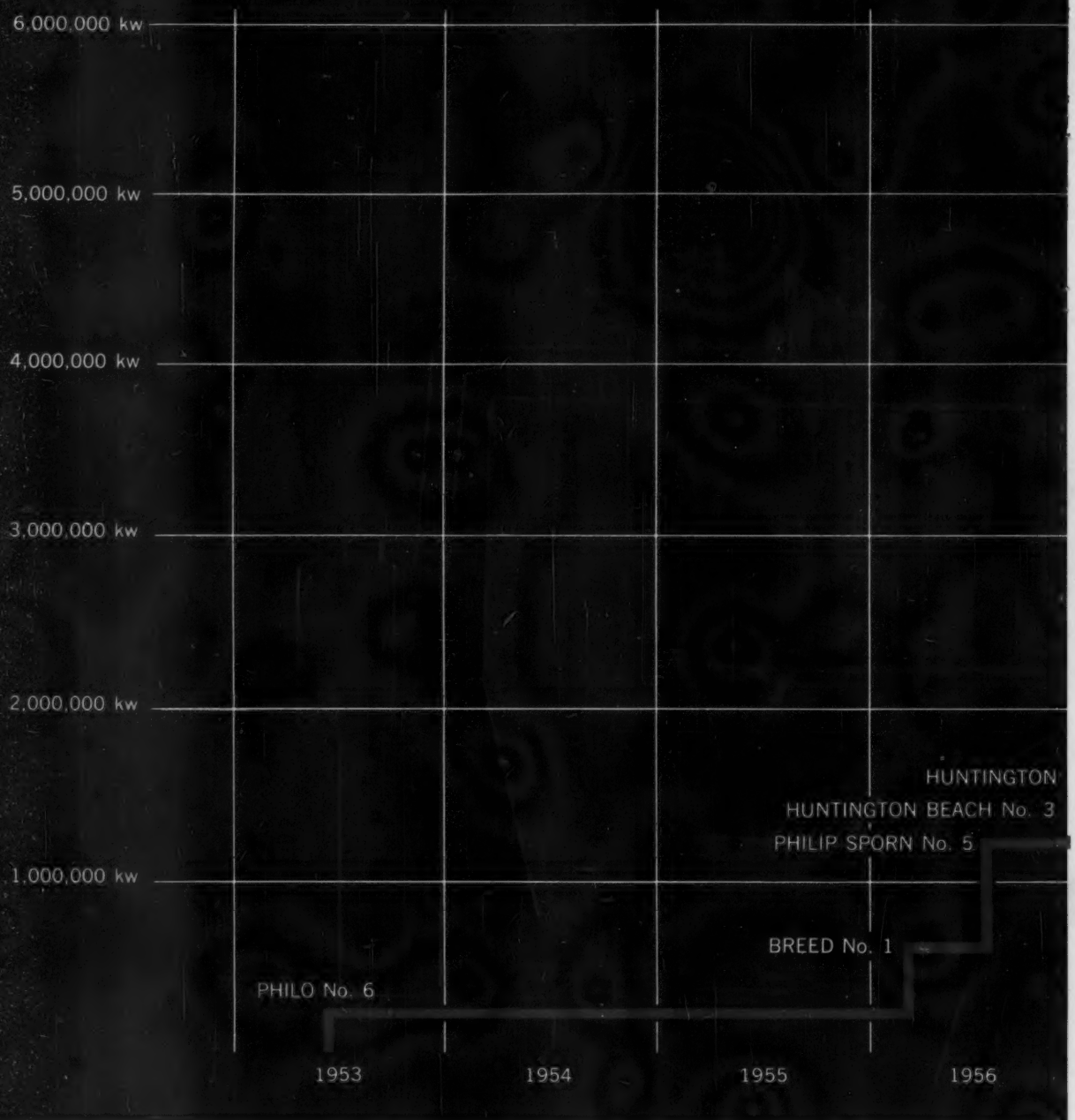
DICK TASKER

JIM MONARSKI

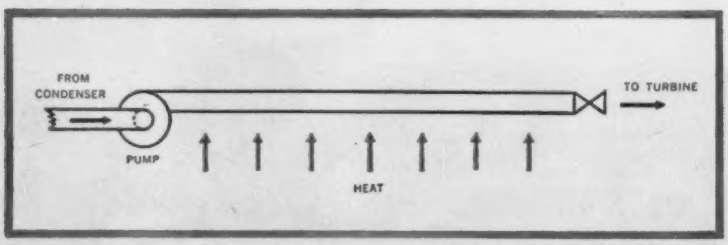
BOB DALE

BERT ROSE

"WHITEY" KOHLER



Acceptance for B&W Universal Pressure steam generator

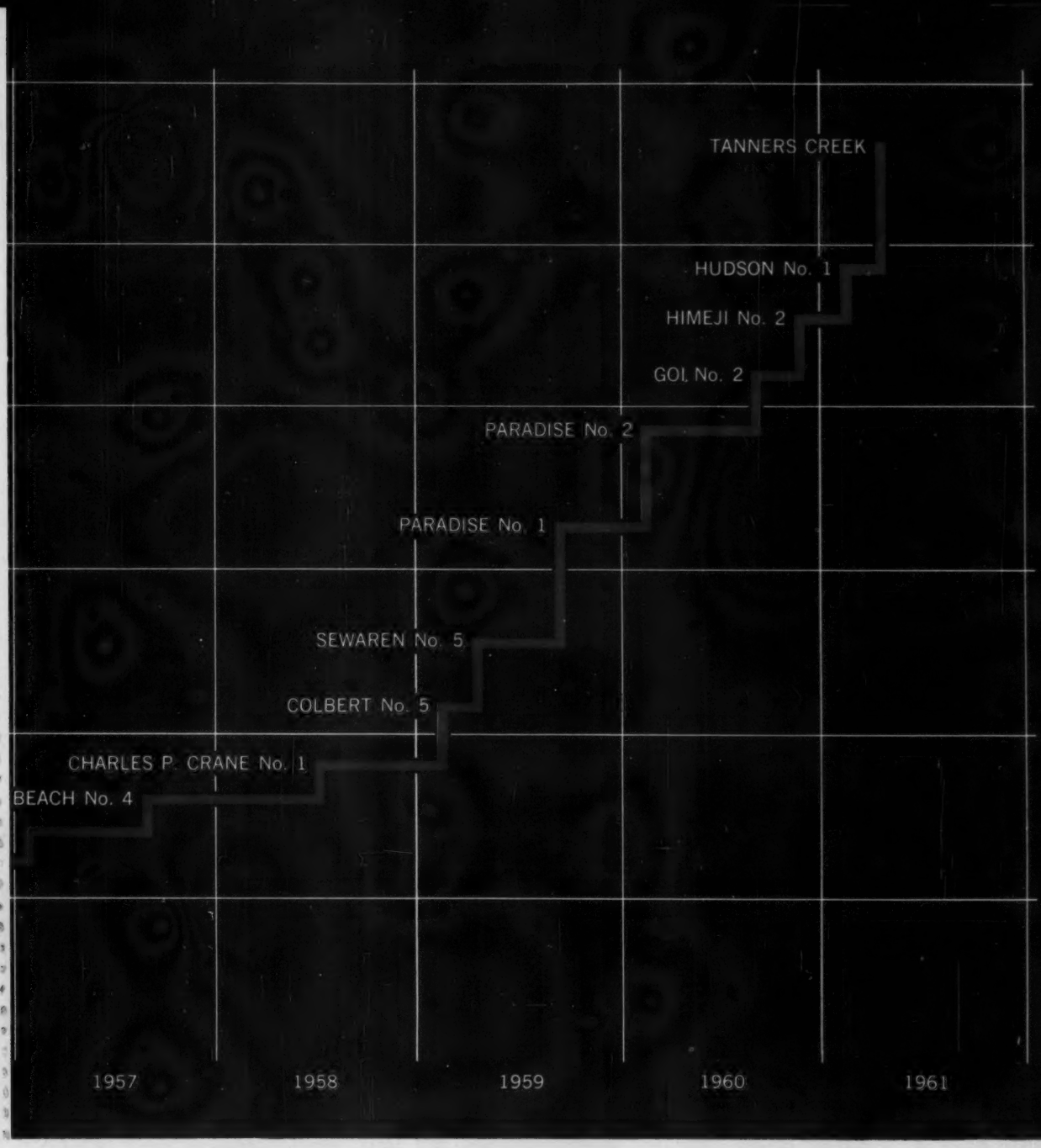


The Universal Pressure steam generator is a true once-through boiler. In effect, a long tube. Water enters at one end, picks up heat, changes to steam, becomes superheated and leaves the other end at the desired temperature and pressure.

Fourteen Universal Pressure steam generators are now installed or on order from Babcock & Wilcox. Five will operate at turbine throttle pressures of 3500 psi and higher. Nine are for operation at 2400 psi.

These 14 plants represent a three-quarter of a billion dollar investment by the utility industry.

What is behind the trend to the Universal Pressure boiler? There are four major reasons.



keeps growing. Orders now top 5,500,000 kw.

1. Increased availability. The Universal Pressure steam generator is a true once-through unit. Its inherent simplicity has resulted in 95 per cent boiler availabilities.

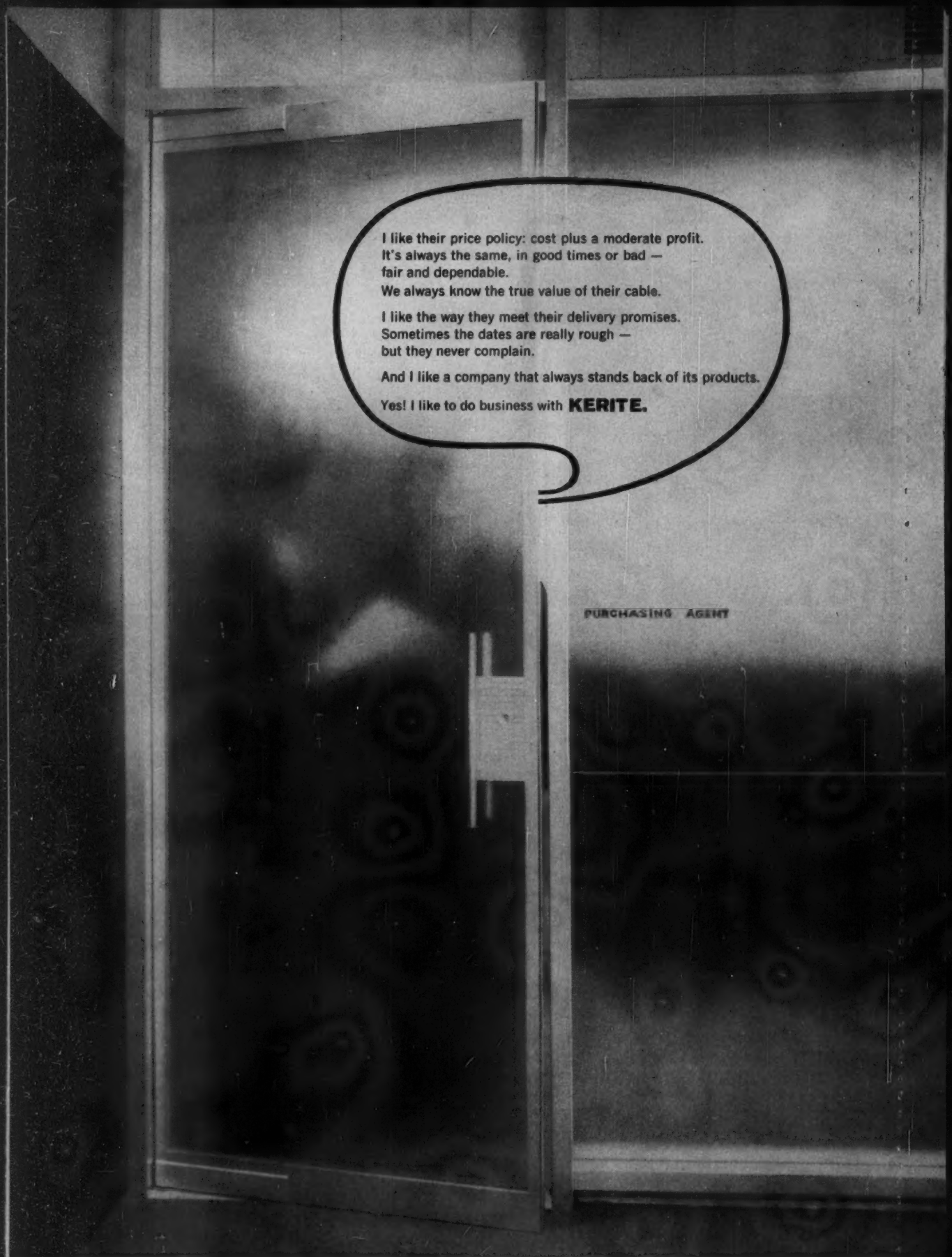
2. Increased economy. Ability to maintain steam temperatures over the entire load range improves the plant's overall efficiency. B&W's flexible by-pass system permits start-ups with minimum fuel and economical low-load operation.

3. Lower maintenance costs. After trip-out, the Universal Pressure steam generator can be entered for maintenance in 2½ to 3 hours. Fast cold starts and hot restarts can be made without thermal shock to turbine parts or steam piping. The condensate polishing system provides maximum protection against boiler or turbine deposits. Gas conditioning minimizes superheater creep, corrosion, and slagging.

4. Reduced overall plant capital costs. A Universal Pressure steam generator weighs approximately 20% less than a drum boiler. Foundations can be smaller and less expensive. Less steel is required. Erection is simpler and faster.

For more information write to: The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

Babcock & Wilcox


I like their price policy: cost plus a moderate profit.
It's always the same, in good times or bad —
fair and dependable.
We always know the true value of their cable.
I like the way they meet their delivery promises.
Sometimes the dates are really rough —
but they never complain.
And I like a company that always stands back of its products.
Yes! I like to do business with KERITE.
PURCHASING AGENT

THE KERITE CO., 30 CHURCH ST., NEW YORK 7, N. Y. DESIGNERS AND MANUFACTURERS OF PREMIUM GRADE INSULATED WIRE AND CABLE, SPLICING TAPE, RUBBER CEMENT. AGENTS IN PRINCIPAL CITIES. A MEMBER OF RAILWAY PROGRESS INSTITUTE.

Editorial Comment

SEPTEMBER 18, 1961

Achieving Forecasts Requires Industry Dedication

As usual, the real significance of *Electrical World's* annual industry forecast lies, not in the numbers, not in the accompanying copy, but in the implications which can be drawn. This is especially true of the long-range sector.

Our short-range forecast, through 1965, is made from very latest data. We've always been able to achieve high short-term accuracy, limited only by the precise timing of recessions and boomlets.

The longer range is far more difficult. It must cope not only with factors immediate to the electrical industry, but with such outside influences as government policy on forcing the overall economy.

Some optimistic forecasters view the future from the extreme under which all factors act simultaneously in one direction to force growth upward. Some pessimists prefer the diametric view that all trend lines bend over eventually—why not now?

We like the mid ground, which results in reasonably attainable growth.

But even the growth rate thus charted is predicated on our confidence in the vision of men in the electrical industry and their energetic devotion to achieving maximum growth within the upward movement of the overall economy.

True, there's always the danger that the surging aggressiveness of gas competition will erode those powerful influences which have underwritten the customer's growing preference for electricity as a convenient service.

We don't think this will happen. We think there's an increased awareness in our ranks of the heightened competitive aspects of the energy-supply business.

Thus implied in our forecast is the assumption that the same farsightedness and dedication that built the industry will achieve our predictions through 1980.

Investor-Utility Plan Gains Strength in Upper Colorado Battle

The proposal by the five investor-owned utilities to build the main transmission network in the Upper Colorado Storage Basin has been immeasurably strengthened since the House held hearings in June on it and an all-federal plan.

Refinement and revision of the investor-utility proposals, when combined with the earlier modification made in the all-federal plan, appear to present the Senate with a more clear-cut basis for approving the investor-utility plan.

As a panel of the Senate Appropriations Committee prepared to conduct hearings late last week, these arguments were slated for emphasis:

- Recent revision of the five-company proposals, as a result of negotiations with the Upper Colorado River Commission, promises a reduction of wheeling charges in the amount of $146 million over the life of the project. This substantial savings would then be available for reclamation projects in the area.
- Modification of the all-federal plan earlier this year meant an increase in federal investment of $6.7 million over the original all-federal plan. There is still no guarantee that this plan will fully meet system requirements.
- Both the modification of the all-federal plan and the revision of the investor-utility plan have been made since the Eisenhower Administration left office so that the Republican endorsement of the federal plan is no longer valid.
- The opposing plans now before the Senate were not in existence for comparison at the time the previous Administration left office. On the other hand, the Upper Colorado River Commission, representing the governors of the four states directly involved, has had a chance to compare the proposals in their current form and has come out in favor of the five-company plan.

NW Coordination Pact Ready to Sign

Coordination agreement between Bonneville and 11 non-federal utilities is forerunner of planned long-term pact

Hydro-generating utilities of the Pacific Northwest and the Bonneville Power Administration have ready for signing a coordinating agreement for operating all storage and generation on Northwest rivers as if under one ownership.

The one-year agreement, negotiated by 11 generating non-federal utilities plus BPA, the Corps of Engineers, and the Aluminum Co of America (as owner of a share of the output of Chelan PUD's Rocky Reach project), is considered a "pilot plan" preceding the long term coordinating agreement necessitated by the treaty with Canada for joint development of the Columbia River.

Negotiators for the 14 affected parties agreed on a final draft for the short-term agreement, which is expected to be forerunner of a long-term agreement. The draft will be submitted along with supporting factual data for the final policy decision on signing by responsible officials of each entity.

Actual signing is expected shortly, according to Bonneville Administrator Charles F. Luce.

The agreement provides that downstream generating utilities benefiting from water storage at federal dams upstream pay the government $1.1 million during the coming year. The figure was negotiated with an understanding that the government cannot pay for benefits to federal projects accruing from upstream storage at non-federal dams.

The agreement draft sets out the amounts non-federal storage owners will pay or receive. Montana Power Co, with a net gain of $75,200, is the only non-federal utility which will receive more than it pays. Net payments by the other non-federal generating utilities total the $1.1 million to be paid to the government plus the $75,200 to Montana Power.

Under the agreement, Montana Power will receive $294,400 and pay out $219,200. Washington Water Power Co will pay $345,300 and receive $196,000; pend Oreille PUD No. 1 will pay $67,700; Chelan PUD No. 1 will pay $633,000 and receive $61,000; Grant County PUD No. 2 will pay $391,200.

Luce said signing of the agreement will mark the first time an area-wide hydro system has been fully coordinated with a variety of owners participating voluntarily without anyone losing identity or

House Spurns Hanford Again, Approves

- **251-155 vote rejects $58-million NPR compromise plan**
- **224-182 vote approves federal plan for Colorado grid**

The House of Representatives last week divided its support on two key power measures:

- By a decisive, 251-155 vote, it turned back a compromise plan to build a single, 400-Mw generating unit at the Hanford reactor.
- By a closer vote, 224-182, the House voted funds to start work on a federal transmission grid for the Upper Colorado storage project. These funds are included in the public works appropriation bill for fiscal 1962, which the House also approved and sent to the Senate.

Both the Hanford and Upper Colorado lines still face more legislative procedure, however before the 1962 session of Congress ends.

The House's big vote against Hanford will send the AEC authorization bill (of which Hanford is a part) back to another Senate-House conference, and almost certainly the new conference will recommend deletion of the controversial power facilities this year. The Senate then probably will accept the AEC bill, as passed by the House, which left out Hanford power facilities.

Joint Atomic Energy Committee Chairman Chet Holifield (D-Calif.) told *Electrical World* he didn't care if any of the rest of the AEC bill was passed this year, if Hanford was defeated. But there is little chance that Congress will shelve an AEC bill, especially under the prodding of Joint Committee Vice Chairman John Pastore (D-R.I.) and other committee members.

The new Senate-House conference on Hanford and the AEC bill is expected to take place quickly.

Quick action on the Upper Colorado lines was set also, as a Senate appropriations subcommittee held a two-day public hearing late last week in an effort to finish the Senate committee's action on the big public works money bill shortly.

House opposition to Hanford came from a combination of GOP, coal-state, southern and conservative representatives. Opposition to the federal Colorado lines, failed, mostly, to win similar strength from coal-state congressmen in particular, from the other groups to a lesser degree.

Appropriations approved by the House are the same as approved by the committee.

The House unit's money recommendations provide the Corps of Engineers with $680,893,000 for construction, the Bureau of Reclamation with $153,283,500 for construction plus the Bureau's Upper Colorado project which comes to an additional $55,468,000. All these figures are smaller than their counterparts in the 1962 budget.

Bonneville Power Administration would receive $33,080,000; Southwestern Power Administration, $2,260,000; Southeastern Power Administration, $800,000; Tennessee Valley Authority, $38,203,000.

The House committee, by a close margin (27-17 in full committee, 7-5 in subcommittee), included $13,673,000 for federal transmission lines for the Upper Colorado River project; and it also included funds to

sacrificing management and control of its system.

The agreement provides a comprehensive plan for operating all Storage and generation on Northwest rivers. Luce said it will formalize and assure dependability of an estimated 1,000 Mw already added to the region's power supply through existing coordination and will "add a further substantial amount of firm power."

Negotiated 15 Years

Evolved from the Northwest Power Pool, the final draft agreement culminates 15 years of study and negotiation. Ten months of intensive work by parties to the negotiation (under the chairmanship of Gordon C. Culp, Seattle attorney for Corporate Service, Inc) brought the agreement to the signing point.

Parties besides those named are City of Seattle, City of Tacoma, City of Eugene, Puget Sound Power & Light Co, Portland General Electric Co, and Pacific Power & Light Co.

Upper Colorado

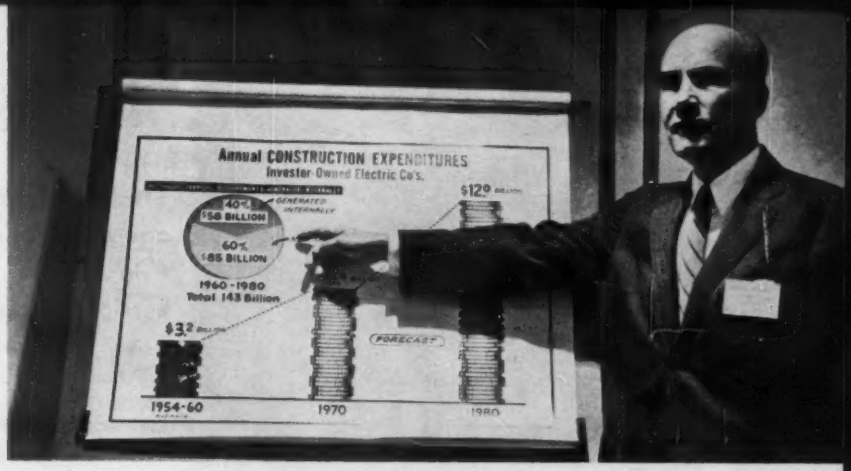
build a federal transmission tie between the Trinity power project and the Central Valley system, Calif. However, the committee deleted funds, opposed by Pacific Gas & Electric Co, to build a federal line between Central Valley and the Shasta area PUD.

A $300,000 study was approved by the House unit for the Bureau of Reclamation to continue studies on federal interties—most of this to go for the Bonneville-California study, Upper Colorado lines and, possibly a Bonneville-Missouri Basin line.

Another study into pumped storage power projects ($150,000) also was approved by the House committee, much to the chagrin of Rep Wayne Aspinall (D-Colo.), whose House Interior Committee hasn't completed authorization hearings.

Funds ($487,500) to start construction of the Burns Creek power project, Ida., were deleted.

The House committee also cautioned that it may look next year into "the potential for overlap and duplication in the general investigations program of the Corps of Engineers and the Bureau . . ."



Udall Calls EEI Plan 'Timely'

Interior Secretary Stewart Udall terms the Edison Electric Institute plans for interconnections as "timely" and sees them as a prelude to "a cooperative industry-government effort" to integrate public and private transmission systems.

Udall's statement was made in response to the unveiling last week of investor-owned utility interconnection plans (EW, Sept. 11, p 42) this coming decade by EEI President Philip Fleger (photo).

At the same time that Fleger released to the press the national story on interconnections, many utilities across the country released their own local or regional versions.

These regional stories, apparently, were the spark for what newspaper coverage there was of the EEI plans. The national story was not carried by most papers (only one wire service used it).

In New York, the story made the financial page of the major newspapers. In Washington, the *Post* treated it as part of the subject of private vs. public power grids.

Udall said, "I am pleased to learn of these new plans for the pooling and interconnection of the nation's power resources. Since President Kennedy issued his message on natural resources in February of this year, there has been an increasing awareness on the part of the entire utility industry of the need to make optimum use of the nation's electric power facilities.

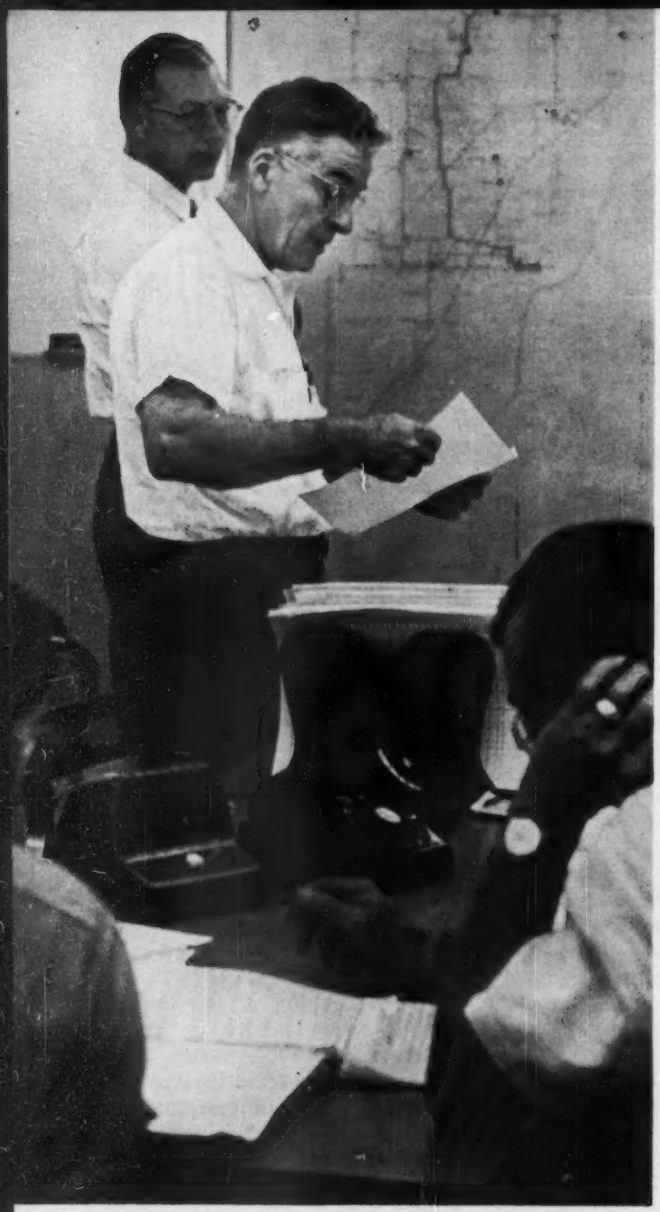
"It is timely that both public and private sectors of the power field are looking beyond mere interconnection of lines and are considering the advantages of extra high voltage transmission. Many countries in Western Europe have already proved the mutual benefits to be obtained by such cooperation.

"The next step to be taken is a cooperative industry-government effort to fully integrate the consumer-owned and federal transmission systems with those of private industry. These public agencies represent nearly 25% of the nation's electric power industry. Such a move would be in the interest of sound, complete, overall planning. Wherever practical, these major lines should be operated on a common carrier basis.

"In recognition of the Department's responsibilities in power interconnections and pooling, I appointed a committee in April of this year to join with representatives of the Edison Electric Institute to study these possibilities with special attention to the economics and the advantages of extra-high voltage transmission. I am hopeful that this committee can now be activated fully and assume its responsibility in this important field of resource planning.

"It is our intention to examine as soon as possible the proposals of the Edison Electric Institute to see if we can move another step forward toward full interconnection and pooling of the output of both private industry and government generating plants. Until we have had an opportunity to review the plan in more detail it is impossible for us to comment more specifically on the lines that are proposed."

[In New York, EEI said it was asked by Udall to appoint a committee to study EHV standardization.]



Carla Ushers in

- **Initial reports indicate relatively light damage to Texas and Louisiana utilities**
- **In Florida, a utility conducts a series of hurricane rehearsals with its employees**

After putting its employees through a series of "hurricane rehearsals," a Florida utility was ready and waiting for the season's first hurricane to hit the US.

But Carla decided she liked the Texas-Louisiana coastline better, and with winds of up to 173 miles an hour and tides ten feet above normal, multi-million dollar damage was inflicted last week to crops, buildings, boats, power and communication lines.

The utility, Florida Power & Light Co, had successfully held a series of "dry runs" to give employees practice in storm restoration work (see photos this page). While there was a good chance they would be confronted with the real thing before the season was over, for the time being attention was centered in Texas and Louisiana.

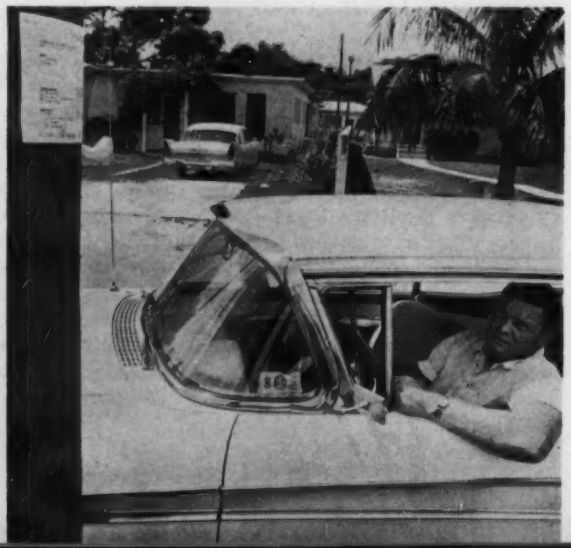
There, initial reports from utilities in the path of Carla (see photos next page) indicated relatively little damage to the systems, considering the violence of the storm. But it remained to be seen whether this appraisal would continue to hold true as utilities returned into the affected areas. At midweek, there were no reports of generating plants being affected.

Here is a rundown of initial reports:

- Gulf States Utilities Co: Most trouble from trees blown down on distribution and feeder lines . . . transmission lines suffered little damage . . . most troubles localized . . . main trouble at Beaumont, Tex., where poles feeding four 34.5-kv lines to downtown area burned down . . . company offered to send extra line crews to help other Texas utilities.
- Central Power & Light Co: In Corpus Christi area, "most of damage not too extensive" . . . only two sub-

AT FLORIDA P&L'S STORM HEADQUARTERS (above), supervisors keep track of progress and activities during the "dry run," as they would do in an actual storm. Reports are received from area headquarters (below) which assign crews

STORM "DAMAGE" (white tag on pole) is observed by utility men scouting the territory who radioed in their reports



Hurricane Season

stations out . . . no material transmission interruptions . . . no power out on main distribution lines . . . trees on lines causing most trouble . . . no outside emergency crews needed.

- Texas Utilities Co: Contacted its companies and offered help but none needed it.
- Houston Lighting & Power Co: No reports available, especially on flood-hit Galveston.

The hurricane rehearsals by Florida P&L in August capped the training of many employees (400 in the Miami area alone, including many office workers) in storm restoration duties.

FP&L's storm plan for this season is an improved version of the one used last year when hurricane Donna ripped through the area and left 400,000 customers on the system without service. At that time, a pre-planned course of action and an all-out effort by emergency employees restored service to 75% of the customers within 48 hours.

"Donna provided a real test of our storm plan," says R. C. Webb, storm organization administrator. "It showed us where we could make improvements to streamline the restoration operation."

Key to FP&L's service restoration procedure is decentralization. Instead of operating as one company, FP&L suddenly becomes many small "companies" after a blow. Miami itself is divided into six groups which are subdivided into a total of 30 areas. Each area is operated as an entity, with a restoration group consisting of a supervisor, utility men, clerks, commercial men, and crews.

During the rehearsals, activity centered around FP&L's main storm headquarters in Miami. Simulated damage and repairs were reported in the areas and information was funneled to headquarters where it was reviewed and recorded.

CARLA TORE DOWN palm trees in Corpus Christi (above), 65 miles from the storm's center which passed over Port Lavaca (below) where derrick and poles slant awkwardly

REA Makes First Area Development Program Loan

The Rural Electrification Administration has made its first loan to assist local economic expansion under the Department of Agriculture's Rural Areas Development Program.

The $23,000 loan was made to the Verendrye Electric Cooperative of Velva, N. Dak., which is in a drought-stricken farming area. The co-op will re-lend the funds to Thompson Construction, Inc, of Velva, which will use them to purchase and install electrically-powered gravel crushing and washing machinery.

The loan will finance 80% of the total cost of the new facilities, and the firm anticipates the facilities will open up 10 new jobs in its locality, which is a disaster area.

Directors of the co-op applied to REA for a consumer facility loan when the Thompson firm could not borrow the funds from other sources, public or private.

Farm production and income have suffered in the Velva area because of the 1961 drought, and, REA says, "several defense and highway projects are planned for the area. These are expected to stimulate demand for gravel, concrete and materials which the firm supplies."

In 1959, the Verendrye co-op served about 4,400 consumers, had operating revenues of $900,000, a net margin of $117,000, and 3,400 miles of energized lines.

REA policy on loans to help consumers acquire electrical equipment was expanded recently to gear this lending program to current rural needs for increased non-farm income.

TVA Ponders SWPP Offer

A power-swapping proposal by the Southwest Power Pool to the Tennessee Valley Authority has been turned over to TVA's power division for consideration and negotiation, TVA said.

The SWPP proposal (EW, Sept. 4, p 34) was addressed to TVA Chairman Gen. Herbert Vogel, who has acknowledged receipt of the proposal but has made no substantive reply. Instead, TVA's power manager, G. O. Wessenauer, has been asked to follow up the matter.

Time Studies Prove 2 and 3-Man

Districts can use two or three-man line crews; each foreman plans work for and handles up to five crews effectively

E. J. DeCHAMBEAU, Manager of Methods Engineering, West Penn Power Co, Greensburg, Pa.

One-half hour of production is gained for each man-day by the use of two or three-man instead of an eight-man line crew. In addition, the production rate is increased substantially when these crews are provided proper equipment. The combined effect is an improvement in over-all productivity of at least 15%.

These were the main conclusions of four months of time studies of small crew operations by West Penn Power Co. These studies evaluated an organization built around two foremen who supervised eight three-man crews. For certain jobs, studies were made of two-man crews.

A number of other conclusions came from the time studies:

- A three-man crew is most productive when framing and setting poles.
- For many jobs, a two-man crew is ideal. These include installing transformers, changing deadends, replacing insulators, transferring and removing poles in non-congested areas, and reinsulating or revamping lines.
- There is little advantage in providing two buckets on the aerial bucket truck. Too often the second man is not in proper position to help. If help is really needed, a man can climb the pole or another bucket unit can be moved into position.
- At no time during the study were more than three men on one unit needed.

Opportunity is provided all West Penn districts to convert to two and three-man line crew operation within a few years as a result of this experiment. Much of the present equipment is suitable for small-crew use; the remainder can be replaced in an orderly and economic fashion, as the work load dictates. The new equipment broadly consists of large and small bucket trucks, hydraulic-crane line trucks, small line trucks, and pick-up trucks.

Under the new arrangement, the foreman is responsible for several crews and more of his time is devoted to the planning aspects of their work. He scouts jobs in advance and floats between units under his supervision to check on progress. On-the-job supervision is handled by a working lead-lineman in each small crew. The resultant higher labor rate is more than offset by improved production. This arrangement also provides good training for future foremen. Previously, the foreman, of necessity, spent most of his day with the crew as he had no separate means of transportation.

Time studies were made of this new organization and compared with previous time studies of larger crews made throughout the company. These studies had been made to develop a standard man-hour manual for all types of line work. This manual is used for preparing cost estimates and evaluating crew performance. In the performance rating system, units of work done by a line crew during the month are multiplied by appropriate standards to arrive at a figure called "standard man-hour earned." The figure is then divided by the sum of actual hours spent on the job, providing a ratio of operating performance or effectiveness.

Savings Shown

Table I shows labor savings obtained through use of small crews and improved equipment applied to items which are installed in great quantities by all utilities. When these unit savings are multiplied by total number of units for a year and the current labor rate applied, the resultant savings justifies a substantial investment in new equipment. Additional savings, not shown on the chart, will be found in maintenance work such as relocation and transfer of wire, pins, and insulators.

Of course, these savings do not come about automatically through reduction in crew size and purchase of new equipment. An operation of this type requires better planning of work and training of men, maximum use of equipment, improved use of manpower and, most of all, a sincere desire to improve methods.

A number of other benefits results from the crew size change:

- Service to customers can be speeded, making the rush job less of a headache.
- Linemen don't have to work as hard physically and can be more productive. Reduced strain on legs

(Adapted from Southeastern Electric Exchange paper, April 1961).

Table I—Labor Savings for Common Items

Item	Unit Savings Man-Hr	Quantity, One Year
Dig hole, bury anchor	1.55	6,000
Dig hole, install pole	3.66	10,000
Install crossarm	0.26	12,000
Install steel pin	0.14	31,000
Install rack	0.26	6,000
Install insulated fork	0.13	13,000
Install 12-Kv strain	0.15	10,000
Install cutout	0.13	5,000
Install street light mastarm	1.51	2,000
Install transformer	1.22	9,000
Remove transformer	1.10	5,000

Line Crews 15% More Efficient

and backs should materially lengthen their span of working life.

• Increased flexibility of the organization makes for fewer manpower problems.

• Outstanding linemen can demonstrate their leadership potential when they direct each small crew.

• Personnel safety is improved.

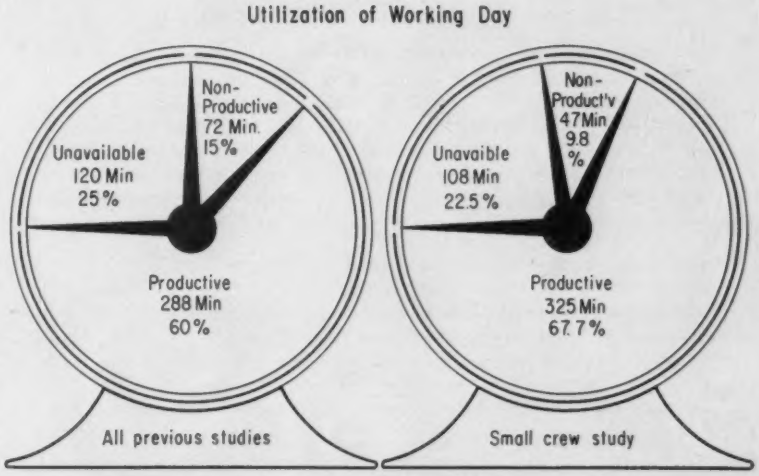
Chart (right) shows productive, non-productive and unavailable time for the small crews and the previous large crews. Two things should be noted. First, non-productive time during the study was reduced from an average of 72 min per day to 47 min per day. Second, productive time increased from 288 min per day to 325 min per day. In addition, not only is a greater portion of the day being spent on productive activities but during this expanded period, the crew is producing at an increased rate because of improved methods and equipment.

Further explanation of this chart may be useful. This chart compares time utilization during the study period for the test district with that which was prevalent for the entire company prior to the study. For this chart, unavailable time refers to time lost during the day because of such things as travel, meetings, breakdowns, unavoidable delays, and bad weather which interrupts work. For the most part, this represents time over which the foreman has very little control. Non-productive time includes personal time, time lost through poor planning, over-manning and items of similar nature.

Time Criteria Told

Productive time covers the actual process of installing, removing or maintaining line equipment as well as time spent on work which is necessary to get the job done but which is not a direct part of the task on hand. This includes materials handling, customer contacts, writing reports and providing safety precautions. The chart does not include lost time due to vacations, sickness or continuous bad weather when the whole day is lost.

Performance of district line crews over the past two years is shown in the lower chart. Performance dropped at the start of the study, probably from the abrupt change to new type of operation and unfamiliarity with new equipment. As foremen and linemen became familiar with the new system and proficient in operating the new equipment, the performance index climbed to a new high.

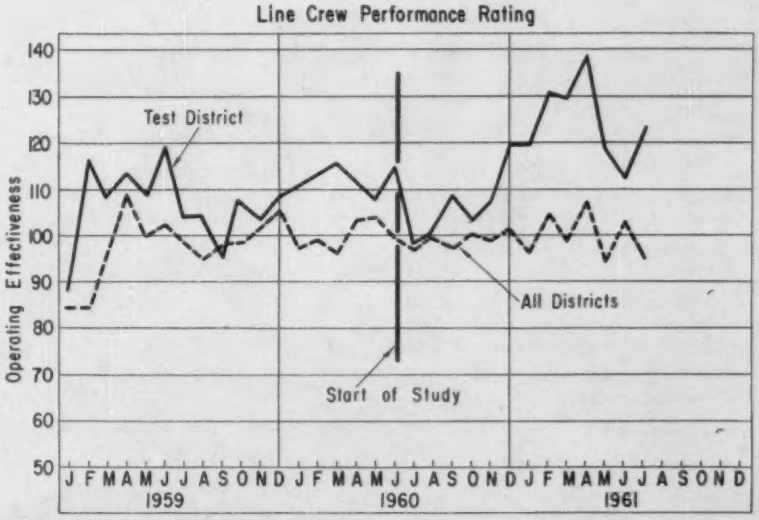


BEFORE AND AFTER CHART shows that productive time per day increased 37 min and non-productive time decreased 25 min with small crews and improved equipment, such as aerial-bucket trucks

Mechanical equipment consists of:

1. Hydraulic-crane line trucks with attached pole diggers. Corner-mounted derricks will be tried because of weight distribution problems encountered with center-mount arrangement.

2. Large bucket trucks equipped



PERFORMANCE INDEX shows abrupt drop when new equipment was introduced, then gradual improvement as workmen became proficient with new system and equipment. Drop was likely due to unfamiliar new methods

Equipment Provided For Eight Small Crews

Two hydraulic-crane line trucks, equipped as follows:

Chassis, 108-in. cab-axle (CA), 135-in. wheel base (WB), licensed for 30,000 lb, gross vehicle weight (GVW); tilt cab; front-center-mounted hydraulic-crane unit which can be moved in and out and rotated at will; hydraulic winch with shaft extension; derrick-attached hydraulic-drive hole digger; 8-ft Fiberglas boom extensions; Fiberglas man-bucket for use on Fiberglas boom extension; and low-silhouette 126-in. line body. No pike poles or ladders are provided or needed.

Three serial bucket trucks, equipped as follows:

Chassis, 103-in. CA, 175-in. WB, 30,000 lb GVW; conventional cab; 50-ft working height; Fiberglas-insulated elbow mounted on turret at rear of truck; low-silhouette 170-in. line body with side opening for material loading; lower section of elbow equipped with sheave and winch line; hydraulic-drive winch. Originally, the trucks were equipped with two side-mounted buckets. Later one bucket was removed and the vacant hub used to hoist material and transformers into place on the pole.

Small line truck, equipped as follows:

Standard 90-in. line body with side compartments and sliding roof; licensed at 11,000 lb GVW; front-mounted mechanical winch; ladder; and small davit mounted on rear to hoist material into the bed. No derrick is provided.

to handle poles and transformers.

3. Small bucket trucks for streetlight and line work not involving pole handling.

4. Small line trucks without derricks. These will be used because a substantial number are now in operation but, as they wear out, they will probably be replaced with small bucket trucks.

5. Pick-up trucks for foremen.

Special compartmentation to conform with standard loading patterns will be specified for all vehicles except the foreman's pick-up. For the test district, the foremen were given half-ton pick-up trucks, free of special compartments and accessories. The idea is to provide a low-cost, economical vehicle which can be used to advantage while planning and scouting jobs and supervising crews. Hauling of material and personnel is of secondary importance.

All vehicles are equipped with locking differential. In addition, small line trucks are provided with four-wheel drive for work in extremely inaccessible locations.

Table II—Man-Hours Reduced for Typical Jobs

	Man-Hr			
	Old Method	Large Crane	Large Bucket	Small Line Truck
Install service pole, service, meter	8	3	5	***
Replace transformer, install farmstead pole, relocate service, meter	13	6	8	***
Construct two-pole, two-anchor line extension	32	16	25	***
Provide capacity-overload, replace and relocate transformer, install transformer and sectionalize secondaries	20	13	13	14
Relocate 2 poles, 2 anchors and wire for highway relocation	30	16	23	***
Install 3 multiple street lights	15	10	8	10
Replace 3 depreciated poles	48	28	35	***
Re-insulate 28 poles and line for 12 kv from 4 kv	143	92	81	115

*** Involve Pole Handling.

Carry Standard Tools

All vehicles carry a standard load of material and tools. Material used from truck stock is replenished at night, and special material and extra supplies are loaded as needed.

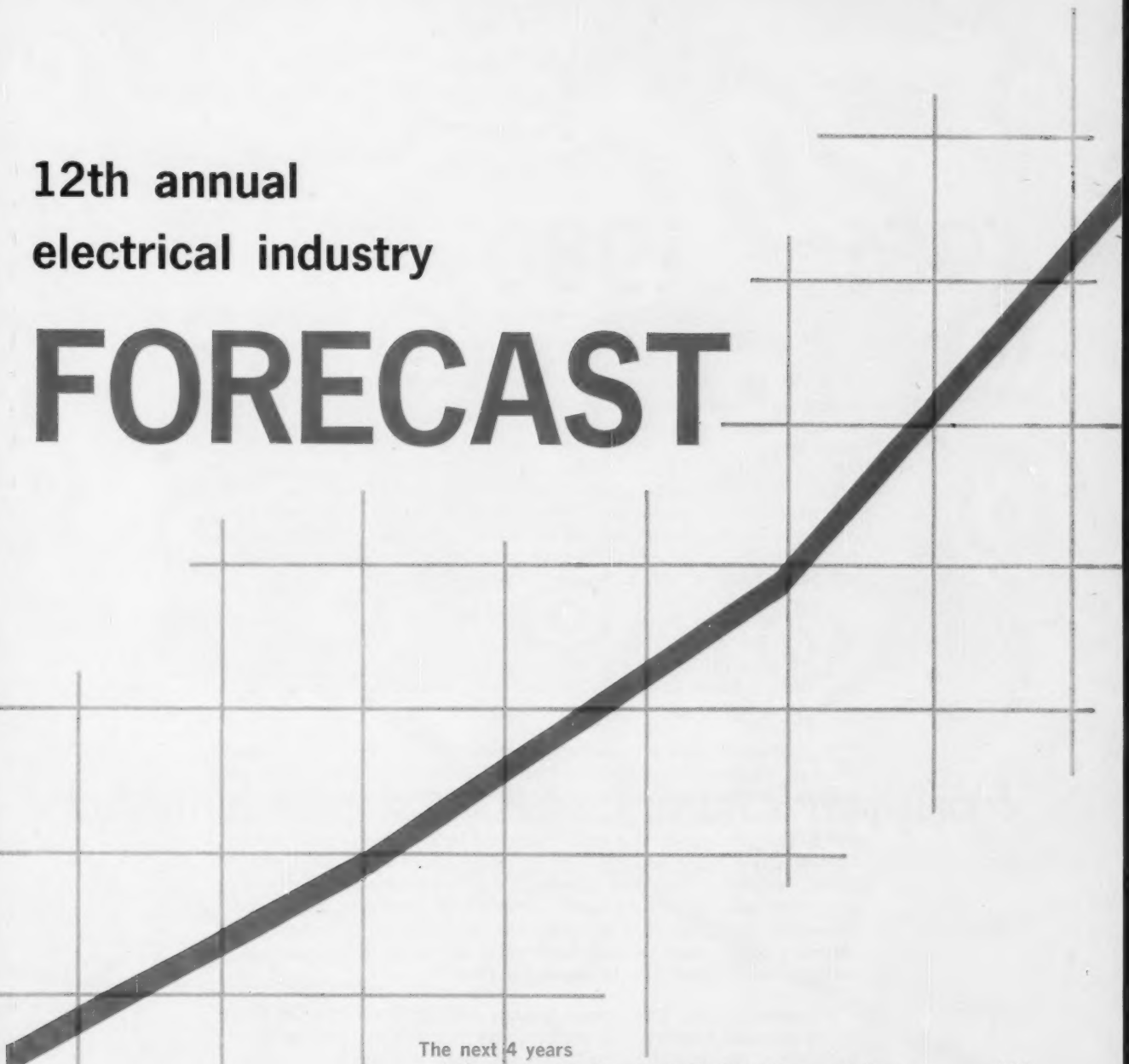
Equipment in the past has been quite conventional. Large line trucks with or without crew compartments, small line trucks without derricks, personnel carriers, flat bed trucks, mechanical hole-digging equipment, jeeps, power wagons have been used. More recently a moderate number of medium-sized bucket trucks were added.

West Penn line crews for the most part are general purpose in nature. At various times they are called upon to handle new construction, removal, maintenance, and operation of overhead lines equipment. Crew size in the past varied to a considerable extent, usually from seven to 12 men, supervised by a salaried (non-working) foreman. In some crews, smaller groups were broken off and assigned separate jobs for greater flexibility. These groups were supervised by a working subforeman who, along with rest of the crew, is a union employee.

Cooperation Good

The test was conducted in a smaller district of the West Penn Power Co. Local supervisors were informed of the tentative plan and, from the very first, their cooperation was enthusiastic. Prior to the study, training sessions were held to acquaint these supervisors with the new philosophy of operation. Crew members were given instructions in safe operating methods. The men's reaction to the new operation has been uniformly favorable.

12th annual electrical industry FORECAST



The next 4 years

Industrial sales bounce back from two recessions 107
Residential sales grow with housing starts 109
Commercial sales follow the shopping center 111
Meeting 1965's 192-million-kw peaks will cost $22.3 billion over the next four years 112
Additions to capacity will total 47,800 Mw but will leave fuel patterns unchanged 112

1965 to 1980

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More leisure hours will boost commercial sales 116
1980 peaks will require 681-million-kw capability 117
Nuclear plants will become competitive 117
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Arthur J. Stegeman,
Manager, Market Research

1961 . . . 1980

In 1980, the United States will be a very different nation. Geographical outlines may remain the same, but the economic activity within the nation's borders will be as different as today's economy is from the economy of 20 years ago.

Of course, there will be more people. Population 19 years from now will be about 42% greater than it is today, and, to house this population, another 21 million homes will dot the countryside. This growth is important. But what is more important is that each person in 1980 America will be far better off than the American citizen of today.

America's Gross National Product will be more than 120% greater than the GNP of 1961. This means that during the next 19 years it will be rising almost three times as fast as population. Or, to look at it another way, there is about $2,800 of GNP for every American citizen today. In 1980, there will be over $4,400.

To make such growth possible, the electric utility industry has to pave the way. Modern houses can't be built unless the electricity is ready and waiting. Much of the growth of the nation's industrial plant—in 1980 about 145% higher than present levels—will depend on greater productivity. This presupposes that more power will be available to every worker, lighting levels will be higher, and in many cases, temperature will be strictly controlled. For these reasons, it's not surprising to find the electric utility industry growing more than twice as rapidly as the economy in general. Each increment to the nation's productivity will require more and more power. And before that increment can be realized the generators and transmission lines must be standing in place.

Electrical World's 12th annual industry forecast looks into the future of the electrical industry. The forecast first measures the short-term outlook—from the present to 1965. Then it looks into the broad areas of national growth which will propel the industry's sales to nearly three trillion kwhr by 1980.

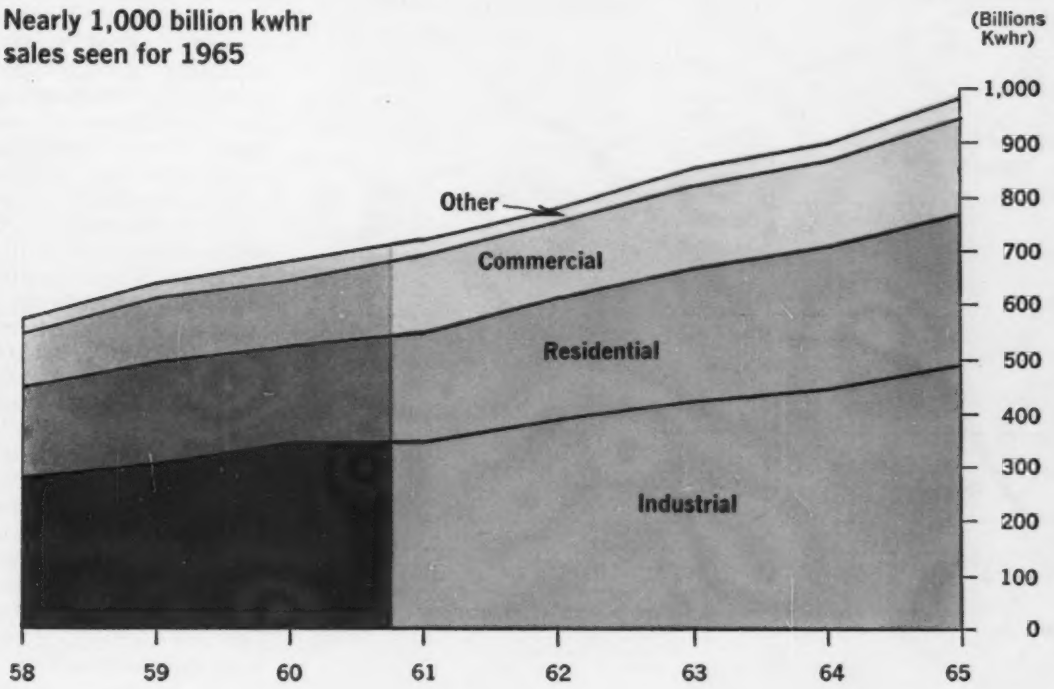
Historical electric utility data used as a basis for this forecast were supplied by the Edison Electric Institute. This year, the Institute has revised many of its figures, forming a new series for some indicators. Because of the revision, it is not advisable to compare historical data in this year's forecast with data presented in previous years. Such comparisons would be misleading.

For example, total electric industry sales for 1960, after the revision, were up 8.7% over 1959. This compares with an earlier estimate of a 6.1% increase.

Edison Electric Institute credits this change to "revisions made . . . to reflect estimates for non-reported data not previously included and adjustments to earlier estimates."

The next 4 years . . .

Nearly 1,000 billion kwhr sales seen for 1965



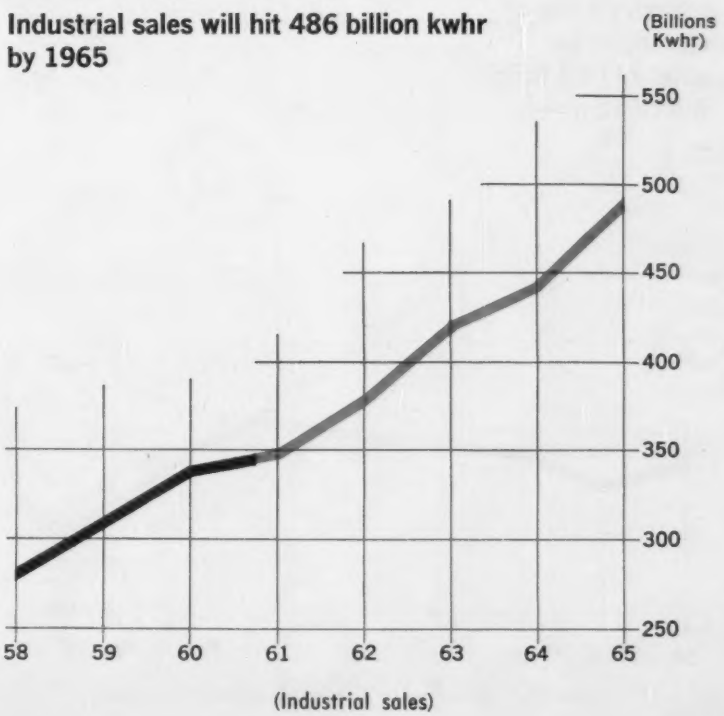
Industrial sales bounce back from 2 recessions

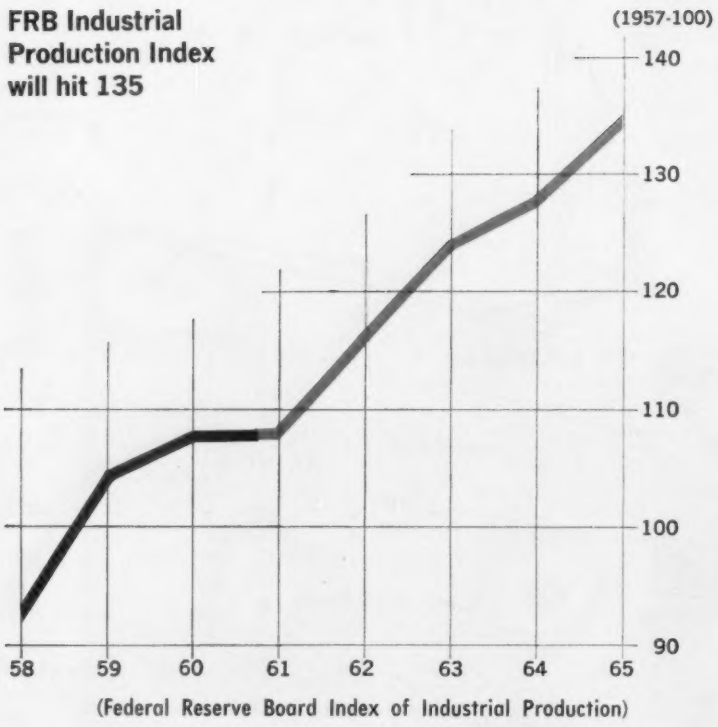
The next few years should be years of rapid growth for industrial sales. After watching their industrial customers weather two recessions separated by an aborted recovery period, electric utilities can now expect to sell more kwhr to their industrial neighbors.

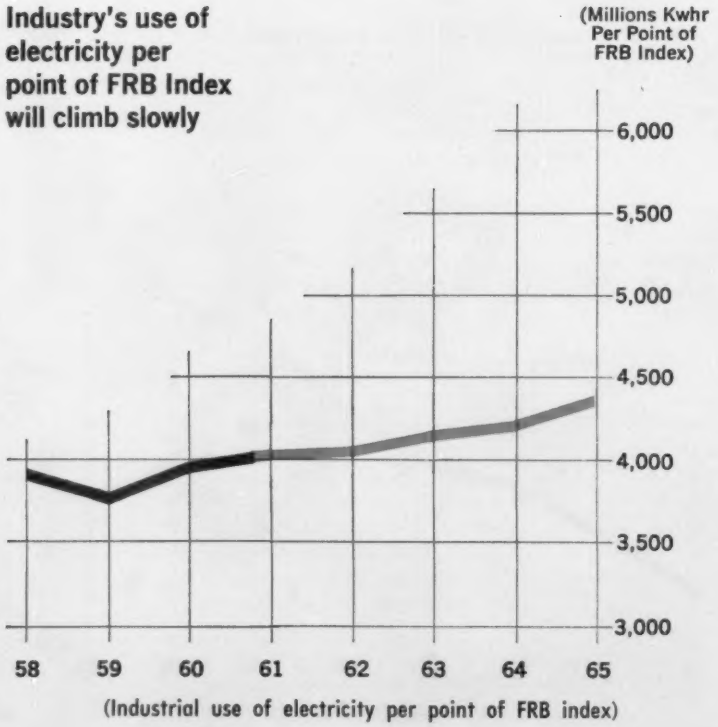
What makes the outlook so optimistic for industrial sales? In relative terms, a great deal. During the past five years, industrial sales, even while posting a 35% increase, have nevertheless been growing at a slower rate than either residential or commercial sales. But now, industrial sales are bouncing back. During the next four years they'll add better than 39% to 1961 levels, outstripping both residential and commercial sales.

To catch the true growth in industrial sales, you have to take a look at two trends. First is the growth of industrial production in general as measured by the Federal Reserve Board Industrial Produc-

Industrial sales will hit 486 billion kwhr by 1965







tion Index. Second is the growth in use of electricity for every point of the FRB index.

Two areas of influence will affect the movement of the FRB index. First, of course, is the broad secular trend which runs through any economy. Such a trend reflects population growth, increments to productivity, trends in income, income distribution, and other similar factors. For any growing economy, secular trend lines can be drawn in only one direction—upward.

But in a short-term forecast, the secular trend is of secondary importance. More important to a short-term outlook is the influence of the business cycle. From 1955 to 1960, for example, it was the business cycle which set industrial sales somewhat below the secular trend line.

For the next five years, however, the business cycle should be working to boost industrial activity. The American economy is now engaged in a strong recovery, and, as more and more idle machines are put back on the line, the FRB rises. This will continue, accelerated by larger defense outlays, until industry reaches an operating rate between 85 and 90%, which should occur during 1962. Then new plant expansions will begin which will send the FRB index still higher.

Industrial growth means reductions in the number of workers unemployed, and consequently, greater gains in disposable income. Lower unemployment also builds consumer confidence which, when coupled with higher income, can be a real spur to purchases of durables. These factors make 1962 and perhaps even '63 look like banner years for the nation's economy, particularly for the manufacturing sector.

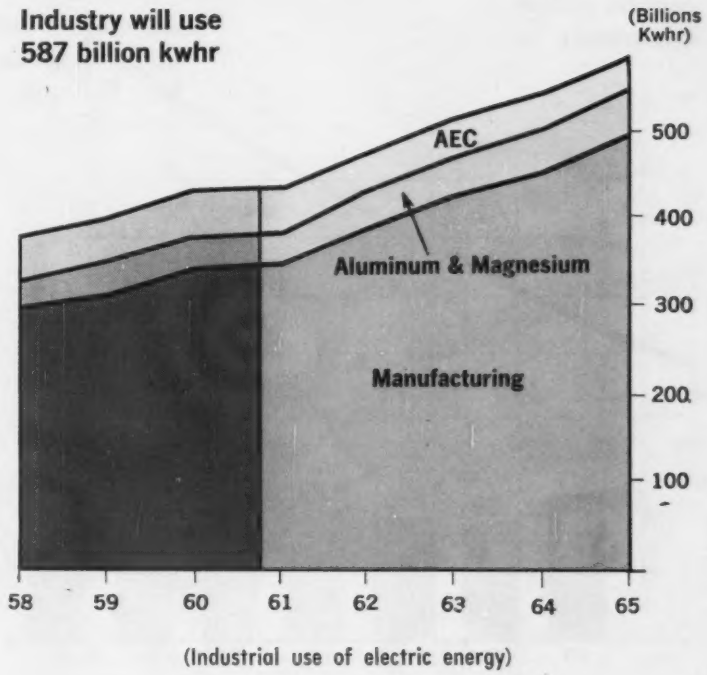
But we've learned from experience that economic growth is never achieved at a steady rate. For this reason, we must expect that growth in some years will be more rapid than in others.

Look for the FRB, then, to grow rapidly into 1963 with some leveling off in either 1963 or '64. But this leveling will be followed by a resumption of rapid growth leading to an FRB figure of 135 in 1965.

By combining the future of the FRB index with an estimate of the industry's use of electricity per point of the FRB, we can get an idea of

future industrial sales. Industry's use of electricity for each unit of production takes two factors into account. First, as new machine methods which are highly automated replace older methods which were only partly electrified, we would expect power used per point of FRB to rise. But at the same time, the new, highly automated machine probably turns out more units than did the old one. This means that the greater use of electricity is being balanced by the higher production. Hence, industrial use of electricity per point of FRB will rise only slowly. And most of this rise will reflect the fact that modern factories make further use of electricity for better lighting and temperature control.

In the next five years, we look for a steady but slow climb in this figure. When you put it together with the strength of the FRB during the next four years, the result is an optimistic outlook for industrial sales. They should grow faster than residential or commercial sales, and in 1965 will be about 485 billion kwhr —39% over estimated '61 sales.



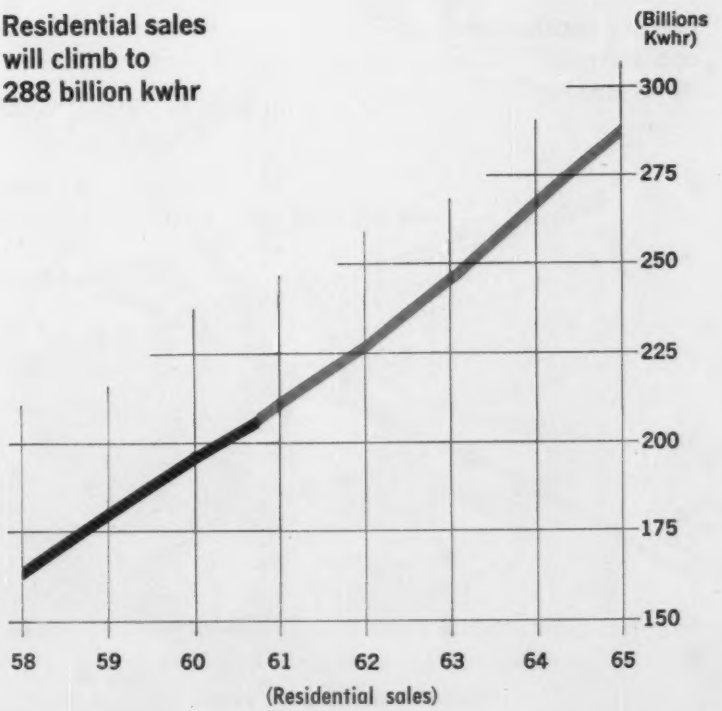
Residential sales grow with housing starts

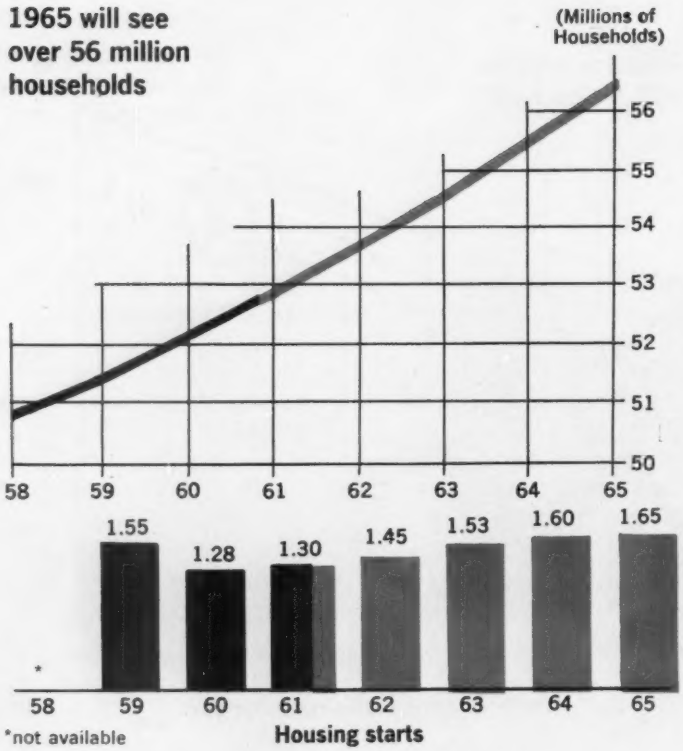
While industrial sales are bouncing back after two rounds of recession, residential sales will be pushing upward from current levels. Estimates for 1961 point to almost 210 billion kwhr in residential sales. In 1965, the figure should be at 289 billion kwhr. This would be an increase of a little over 37%.

Biggest item in the short-term outlook for residential sales is the number of housing starts. While the housing market is off somewhat from the boom years of the Fifties, it still promises gains over 1961 levels. Current estimates put 1961 starts at 1.3 million. 1962 should push upward to 1.45 million.

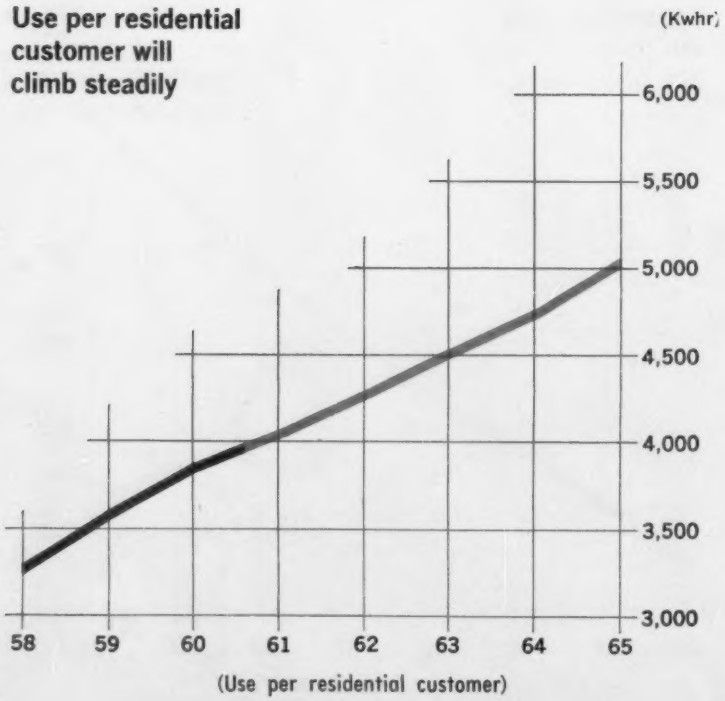
In addition to housing starts, residential use of electricity will be climbing steadily. For 1961, its just over 4,000 kwhr per customer. But in 1965, it will be better than 5,000 kwhr.

There are several reasons for this gain in customer usage. First is the current situation in the housing mar-





(Total households and housing starts)



(Use per residential customer)

ket. With vacancy rates high, consumers are under no pressure to buy new homes. They have a solid roof over their heads, and can afford to wait for a really attractive home to be offered.

Builders are aware that it's a buyer's market, and are cramming houses with built-in appliances. In fact, some builders haven't stopped with appliances. Pick up the real estate section of your local newspaper and see the number of new houses in the intermediate price range that advertise air conditioning as a selling feature. During the Fifties, builders needed to offer no such inducements.

Electric Heat Will Move in Slowly

Then too, there's electric heat which is moving slowly into the picture. It won't make a very big dent in residential usage by 1965, but its influence will begin to be felt.

Combining the increases in housing starts with the higher usage per customer assures residential sales of steady gains until 1965. But while growth in this category will be real, it will not be as rapid as it has been in the past, when it jumped under the stimulus of record years in housing, and the flight to the suburbs.

In 1959, for example, housing starts hit 1.55 million. The economy won't match this figure until 1964, and the difference is too wide to be bridged by the extra appliances offered in today's homes. Then, in the Fifties the vast majority of new units were built in the suburbs. They were one-family units, meaning that each unit had its own appliances, and a yard which required outdoor and patio lighting.

Today, however, the flight to the suburbs is not nearly as frantic. Many of today's units are in multi-dwelling city structures. And in apartment living, there's greater economy of space and no outside yard. This cuts into lighting requirements. In addition, washing machines and clothes dryers are frequently shared.

But these are only mitigating factors in a picture of growth. There are little signs of a boom but there is every reason to expect steady and substantial gains in residential sales. The 37% increase by 1965 may not match the growth from 1955-59, but it's certainly healthy enough by most standards.

Commercial sales follow the shopping center

Commercial sales did extremely well during the last half of the Fifties, and, as we would expect, will continue to grow with the economy.

First, they are bound to gain from the business boom which is currently gaining momentum. As manufacturers increase production facilities, they tend to increase office space from which facilities are controlled.

In addition, the business surge also means higher levels of income, and much of this will be passed on to restaurants, bowling alleys and other places of entertainment.

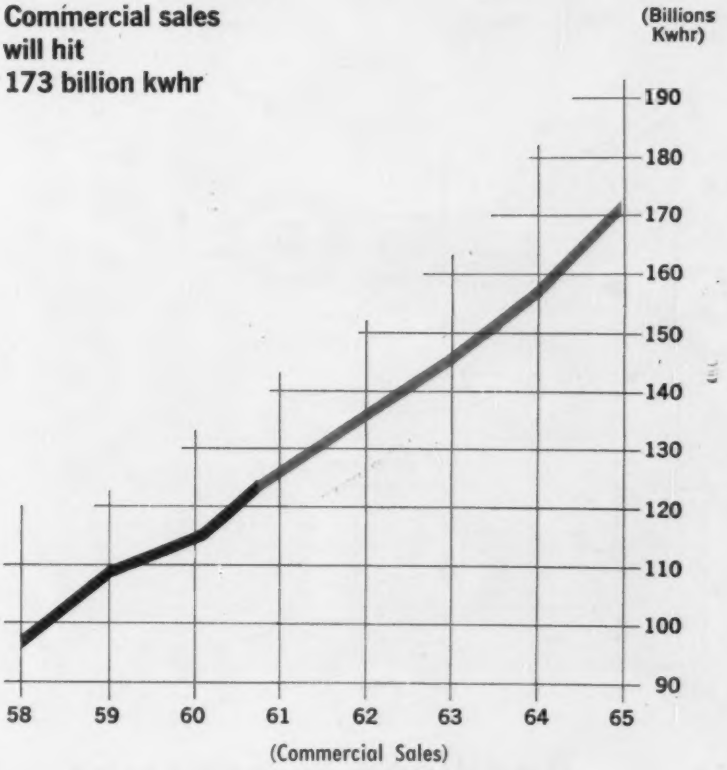
On top of the benefits gained from the business recovery, commercial sales will continue to benefit from the popularity of the shopping center, an institution which grew with the movement to the suburbs.

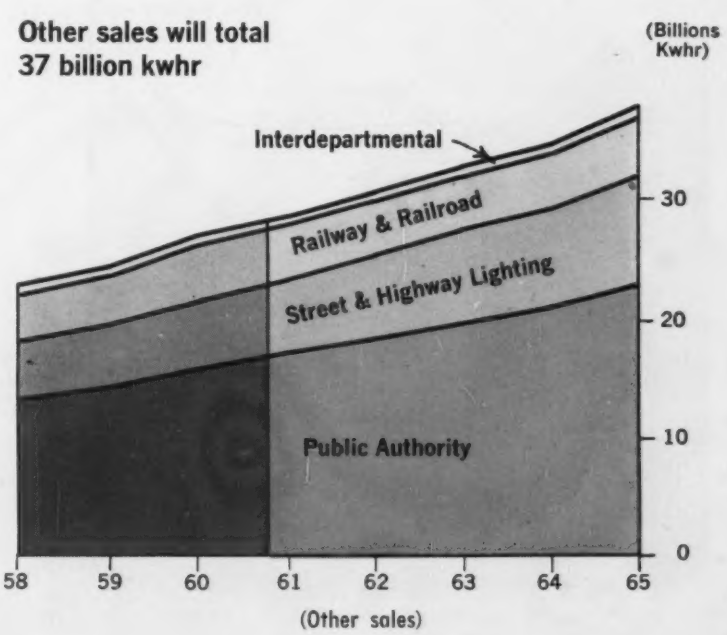
Besides the more modern stores, using high lighting levels and air conditioning, the shopping center incorporates large illuminated parking areas, and spacious, well-lighted plazas. In addition, since autos are frequently necessary for suburban shopping, many families do their marketing in the evening when the car is available to the housewife. This prompts the shopping center to do more of its business after dark.

Commercial sales will continue to do well into 1965. But the lower level of housing starts, combined with a slackening of the movement to the suburbs, may dampen the shopping center boom slightly. For this reason, commercial sales probably won't match their outstanding growth rate of the late Fifties. By 1965 they should account for about 173 billion kwhr, up 36% over estimated 1961 sales.

Street Lighting Load Will Grow

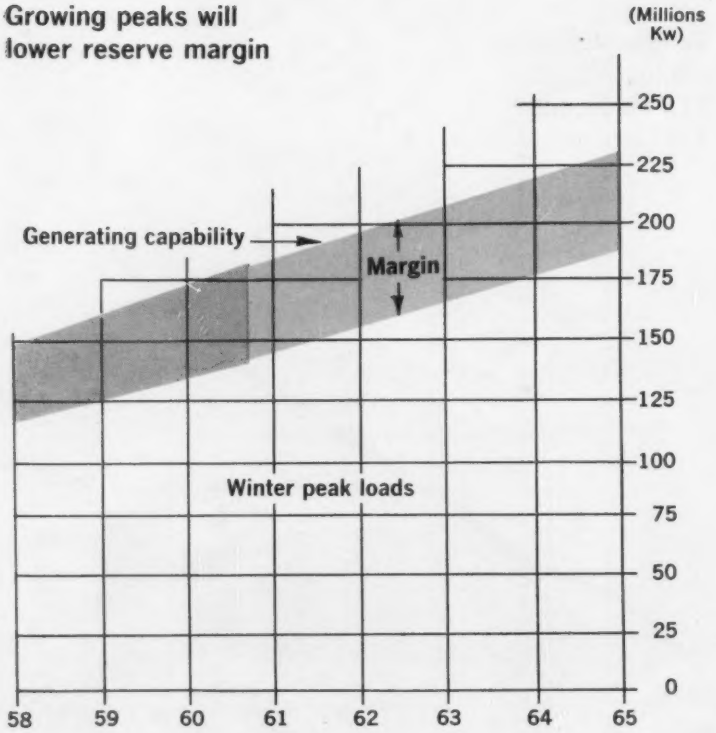
Street and highway lighting will show greater growth than any of the categories classified as "other sales." This rapid growth parallels the development of a national highway system, the need for better lighting on existing highways, and the concern of many cities for more adequate street lighting to curb night-hour crime. Additional growth in "other" sales will be sparked by sales to other public authorities which will jump 35% to 54.5 billion kwhr.





Meeting 1965's 192-million-kw peak load

Growing peaks will lower reserve margin



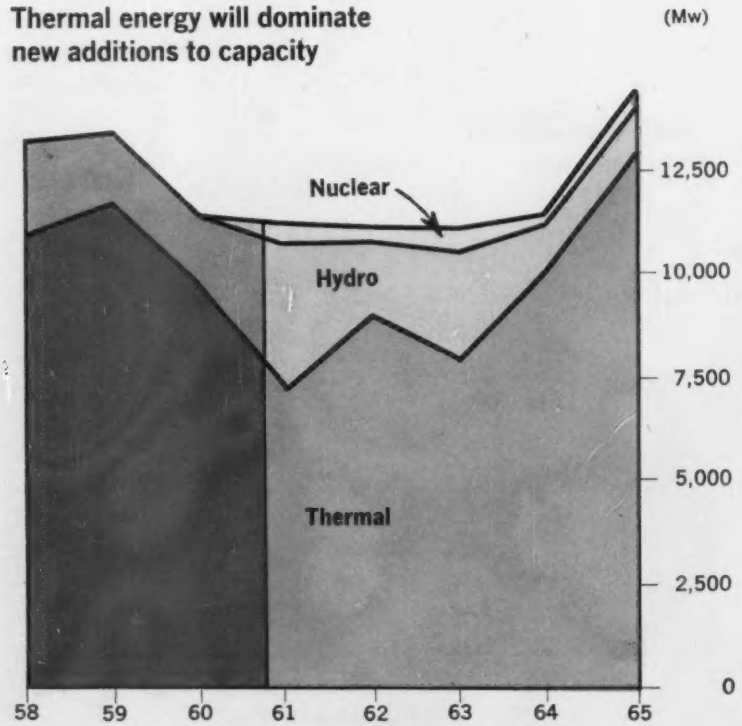
With total sales of electricity expected to reach 983.9 billion kwhr in 1965, an increase of nearly 38% over 1961 levels, peak loads can be expected to advance as well. Winter non-coincident peak loads are estimated at better than 192 million kw in 1965. This will represent a growth of about 33% over estimated 1961 winter non-coincident peak.

To meet these peaks, the industry will, of course, have to add new capability. But for the next four years, additions to capability will not quite match the rate of increase of peaks. This is because the industry now has better than 29% gross margin, a level which is generally regarded as being more than adequate. So, while peaks climb, the industry will add new capability somewhat more slowly. This will put the squeeze on gross margin, bringing it down from present levels to the preferred industry rate of about 22% in 1965.

Despite the squeeze on peaks, it will still take a tremendous capital expenditure to keep electric power

Additions to capacity will total 47,800 Mw

Thermal energy will dominate new additions to capacity



New additions to capacity during the next five years will follow the patterns of the past. Thermal generation will, of course, dominate. But hydro installations will severely dent thermal's percentage of new capacity during the current year, and right on through 1964. This is largely due to the coincidence of several major hydro projects reaching completion during the same short period of years, notably the St. Lawrence and Niagara projects.

Nuclear plants, which first made inroads on new capacity additions during the current year, will fall off again in 1964 and 1965. But this isn't due to any lack of interest. It simply reflects the fact that lead time on nuclear plants is about six years.

Plants now under serious consideration, and even those in the late planning stages, won't be on the line until after the end of 1965. And our figures show additions actually coming on the line; not those which are ordered.

How will new additions affect the

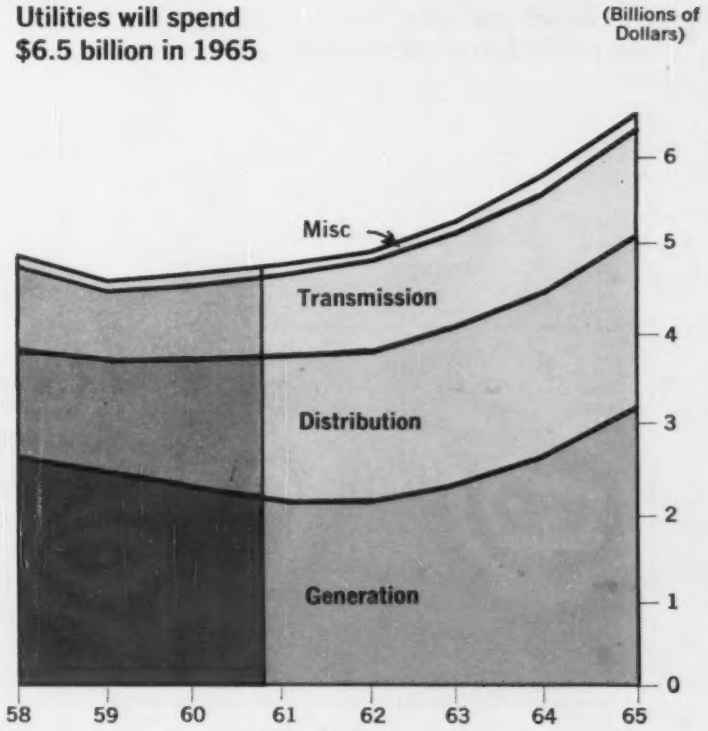
will cost $22.3 billion over next four years

ahead of the nation's economic growth. In 1965, the industry will spend $6.5 billion as against an estimated total expenditure of $4.8 billion for this year.

Generation expenditures in 1962 should be about the same as in '61 with a up-turn coming in 1963 in anticipation of the demand in the mid-Sixties. In 1965, the industry will sink $3.2 billion into new generation.

Transmission expenditures will post gains each year until '65 when they will go over the $1 billion mark. This forecast reflects the tremendous industry interest in interconnections and power pooling. Distribution expenditures, which had grown faster than either generation or transmission from 1958 to 1961, will take second place to generation expenditures for the next four years. Generation expenditures will increase by 52% whereas distribution outlays will move up by 25%, reaching a total in 1965 of better than $2 billion.

Utilities will spend $6.5 billion in 1965



but will leave fuel patterns unchanged

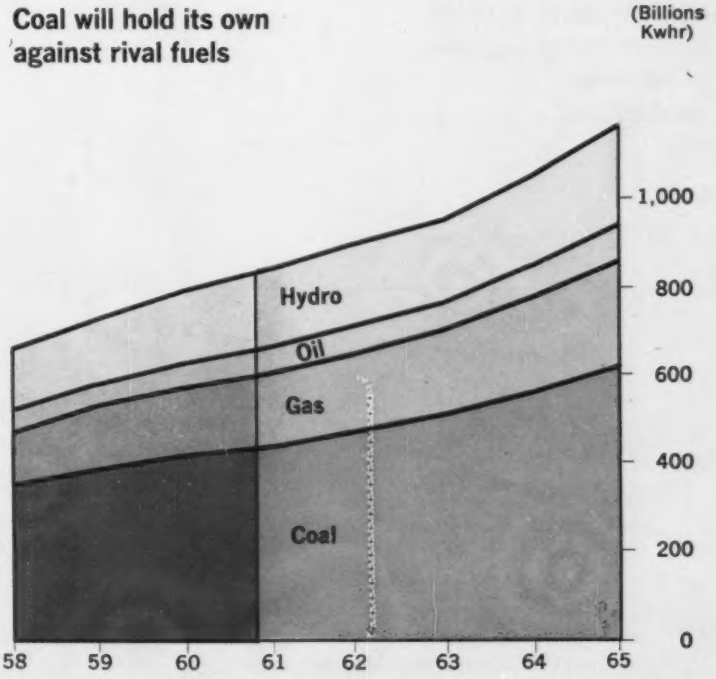
nation's use of fuels? There will be no significant changes, at least not during the next four years.

Fossil fuels will continue to extend their lead over hydro in the production of the nation's power. In 1965 they will produce about 45% more kwhr than they do today. For hydro, the increase is in the neighborhood of 20%.

Among the three fossil fuels, no trends are observable during the next four years. Coal, oil, and gas will advance at approximately the same rate, each preserving its share of the market.

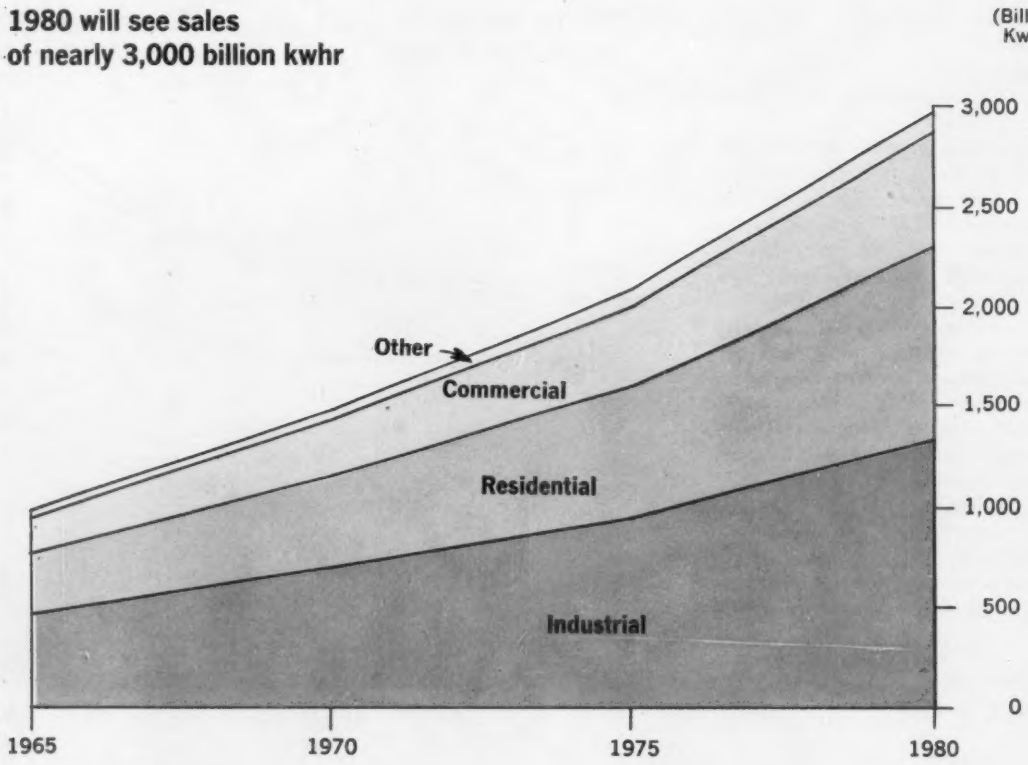
Nuclear fuels, while making an appearance, will not have any impact on the nation's fuel picture. What we will see, during the next few years, is the very beginning of nuclear's growth, accounting for about seven billion kwhr in 1965. In the long run, however, this fuel becomes increasingly important as the economies of nuclear generation become more competitive with conventional plants.

Coal will hold its own against rival fuels



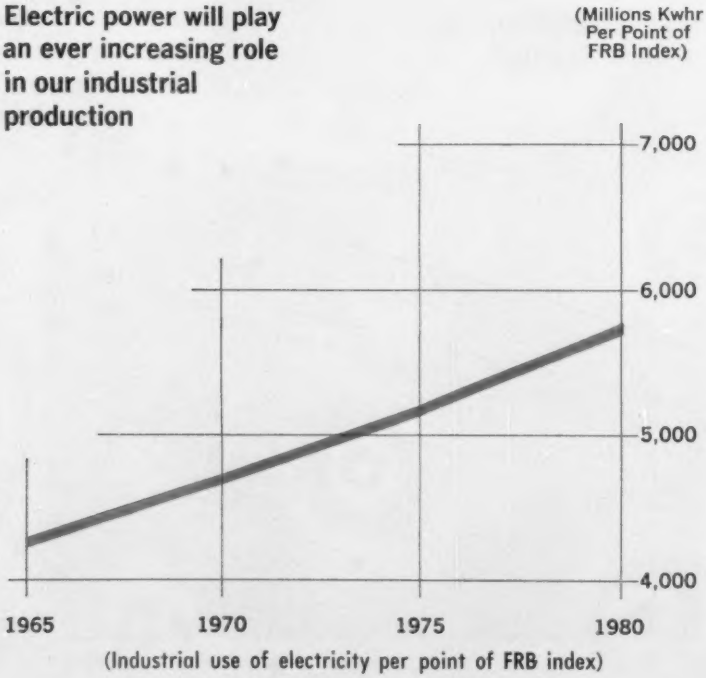
1965 . . . 1980

1980 will see sales of nearly 3,000 billion kwhr



New products mean growth for industrial sales

Electric power will play an ever increasing role in our industrial production



Between 1965 and 1980 the standard of living of the typical American will be rising rapidly. He'll be earning more money in less working hours, and he will spend that money on an enormous array of goods and services.

What kind of products will he buy? Certainly he'll make more use of goods which are already on the market. He'll probably own two cars, for example, a broader variety of home appliances, and will want most of his food pre-processed and cooked instantaneously.

But many of the products he will buy aren't even on the market yet. They will be as new in 1980 as television was in 1945, or as hi-fidelity phonographs were in 1950. And when their day comes, these products, as yet unavailable, will take off just as large a share of the consumer's income as television and hi-fidelity did.

All these products will be sup-

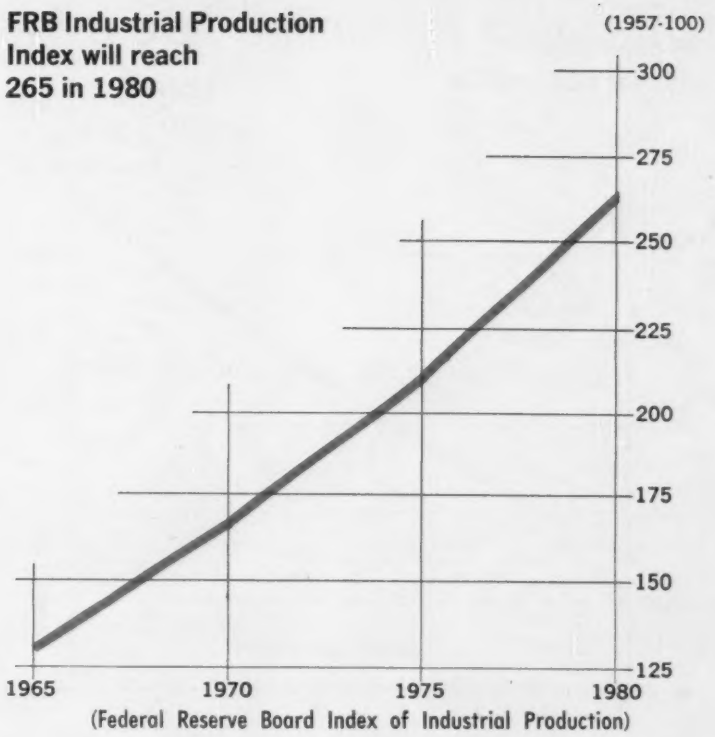
plied by industry. And industry will have to expand several times just to keep the consumer satisfied.

The forecast for the Federal Reserve Board Index of Industrial Production reflects this constant increase in the standard of living. National population will double about every 38 years for an annual growth rate of about 1.8%. Industrial production, on the other hand, will double every 15 years for an annual growth rate of 4.6%. This means that by 1980, the FRB index will have moved up to 265—145% over present levels.

To meet this consumer demand, industry will turn heavily to automation. This, of course, means greater use of electricity by machines that will control other machines. And as we've seen earlier, it will help keep the figure for kwhr use per point of the FRB index climbing.

This gain, combined with the growth of the index, points to industrial usage of about 1.4 trillion kwhr in 1980. Of this, utilities will supply 1.3 trillion kwhr.

FRB Industrial Production Index will reach 265 in 1980



Residential sales will boom with electric heat

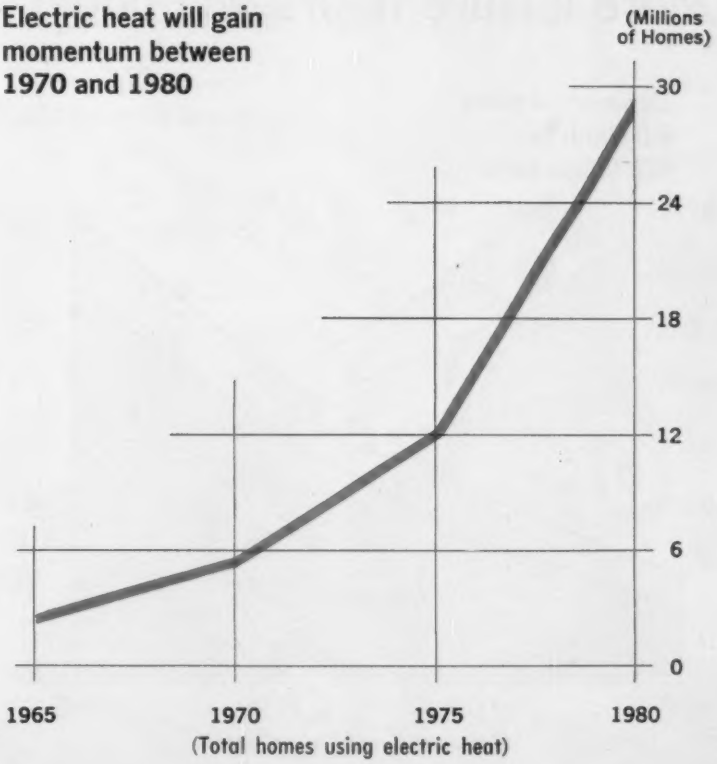
But despite the expected strength of industrial sales, residential sales will hold the spotlight from 1965 to 1980. The reason: total electric living.

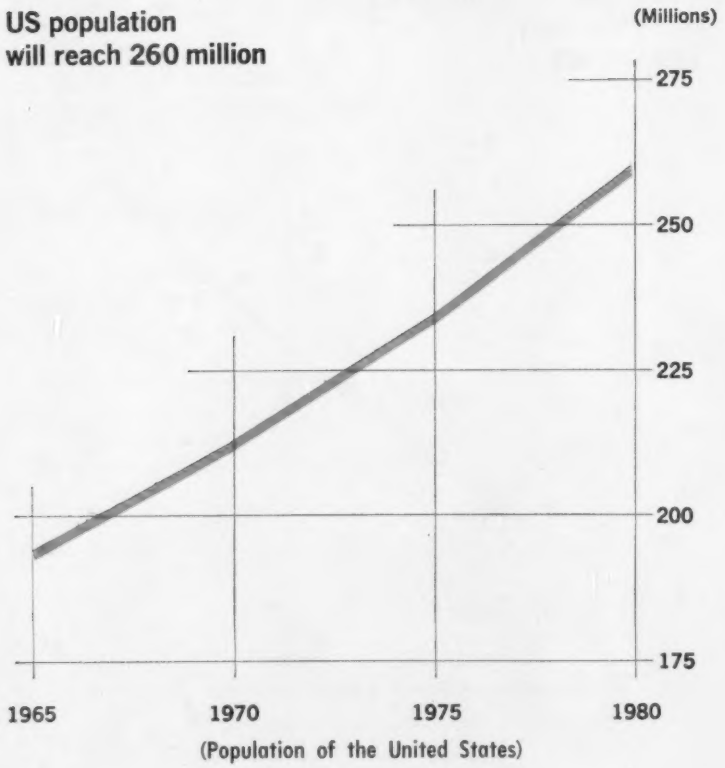
Already, the total electric home is a success. But it's new and not yet its own salesman. As more total electric homes are built, and more existing homes are converted to electric temperature control, then an increasing number of Americans will see the difference first hand. And today's growing curiosity will turn into tomorrow's strong consumer demand.

Look for total electric living to come into its own by 1965. And from then on you can expect the number of homes having electric heat to double every four years for a growth rate of better than 17%. By 1980, 29 million American homes will use electric heat. This figure alone represents more than half as many homes as there are in the nation today.

But this isn't the entire residential picture. The electric heating load will be added on to the vast in-

Electric heat will gain momentum between 1970 and 1980





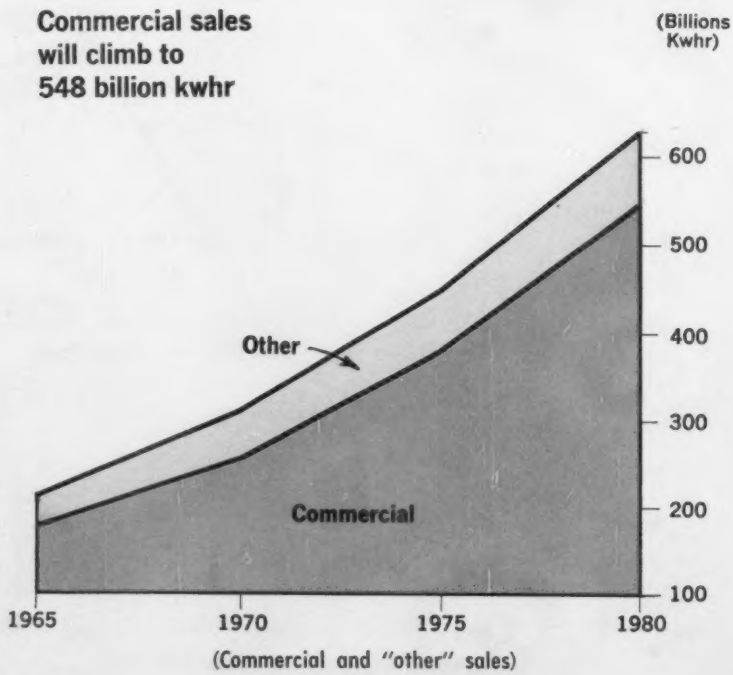
creases in residential sales that will come simply as a by-product of the nation's population growth. In 1980, there will be almost twice as many people in the United States as there are today. And, instead of 1961's 53 million households, there will be 74 million homes scattered across the country.

These homes will make much greater use of electricity than the houses of today. Appliances will relieve the housewife of still more of her home-making chores. Lighting levels will rise, and integral air conditioning will become common.

For these reasons, look for use per residential customer to grow rapidly. From a little over 4,000 kwhr today, each residential customer will raise his use of electricity to well over 12,000 kwhr in 1980. This means an increase of better than 200%.

Put this together with the steady increase in residential customers that comes with population growth, and you find 1980's residential sales at 964 billion kwhr. This would be a gain of 235% between 1965 and 1980.

More leisure hours will boost commercial sales



Commercial sales, too, look for a booming future. And a big part of that future will be the extraordinary growth of service industries in America.

In 1980, consumer disposable income will be at $800 billion. And with the increase of the leisure time available to the American worker, an ever-increasing percentage of this income will be spent in travel and recreation.

The present motel boom will continue, probably at an accelerated rate, to house the hoards of travelers. Restaurants, theaters, skating rinks, bowling alleys, every type of commercial establishment which serves the public's leisure hours will have to expand. And with them, commercial sales will grow, probably to 548 billion kwhr.

Look, too, for continuous growth in street and highway lighting to push other sales to about 92 billion kwhr.

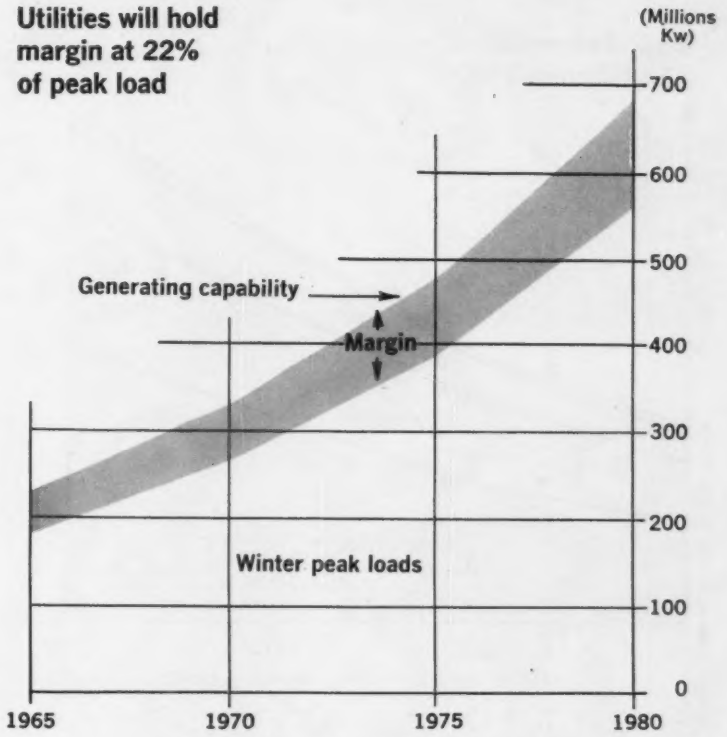
1980 peaks will require 681-million-kw capability

With sales growing rapidly in all areas, the electric industry is faced with a race to stay ahead of peak loads. In 1980, winter non-coincident peak loads will be up to 558 million kw. This is 285% higher than current peaks.

By 1965, the industry will have brought its gross margin down to 22%, a level normally considered to be adequate, but not excessive in view of growing summer peak loads brought on by the increasing popularity of air conditioning. At 22% winter reserve, the industry has only about an 18% calendar year reserve for outages and maintenance.

This means that from '65 to '80, capability will have to grow just as fast as peaks in order to keep margin from slipping to dangerously low levels. By 1980 the industry will need 681 million kw of capability.

Present capability is estimated at 187 million kw. In 1965, it will be at about 235 million kw. This indicates that from 1965 to 1980, the industry will have to expand capability by 187%.



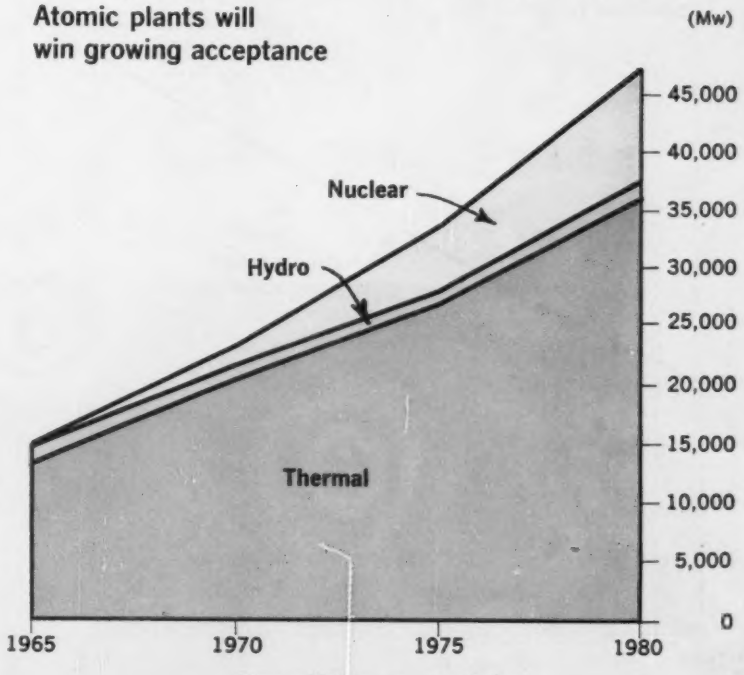
(Peak loads and generating capability)

Nuclear plants will become competitive

But from 1965 to 1980, the breakdown of the electric industry's new capacity additions will be vastly different from the new additions of today. Nuclear plants will have proven themselves economical and workable by 1965, and from then on they will carry away a bigger share of new capacity additions each year.

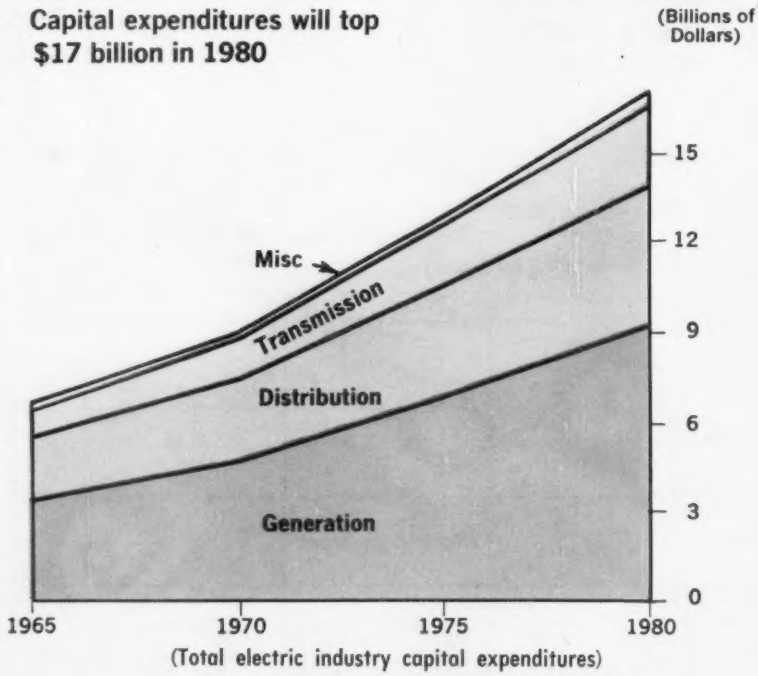
Probably the first inroads of nuclear capacity will be made in New England and on the Pacific coast where fuel costs are relatively high. But from the high fuel cost areas, nuclear plants will spread throughout the country. Of new capacity additions going on the line in 1980, 9,800 Mw will be nuclear. This will be out of total additions to capacity of 47,349 Mw.

As we would expect, conventional additions will still be dominant. 1980 will see 36,449 Mw of conventional thermal capacity come on the line. Hydro additions will account for 1,100 Mw in 1980.



(New additions to capacity)

Capital Expenditures Will Jump 166%



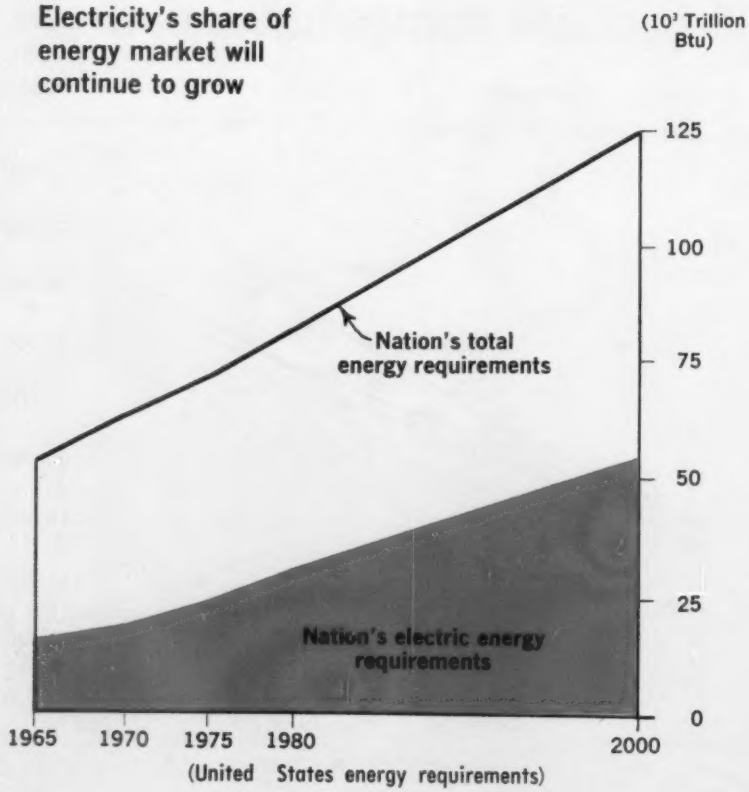
Providing this capability will place a heavy financial burden on the electrical industry. Total expenditures for 1980, for example, will be $17.3 billion. Contrast this with 1961 expenditure of $4.8 billion.

How will the industry spend this money? Most of it will go to generation. By 1980, annual expenditure on generation will be at $9.1 billion, up from the current level of $2.1 billion, and from 1965's $3.2 billion.

From 1965 to 1980, transmission expenditure will rise more rapidly than it will from now until 1965. In 15 years, the industry will be laying out better than $2.7 billion each year, probably under the impetus of interconnections and power pooling.

Dollars spent for distribution will also continue to grow. By 1965 the figure should be at better than $2 billion annually. In 1980 it will reach $4.8 billion.

US will convert more energy to electricity



The advent of nuclear plants will naturally bring alterations to the industry's fuel usage patterns. Whereas in the next five years nuclear fuel can be expected to have little effect on the historical patterns, in the period between 1965 and 1980 nuclear will take a bite out of the fossil fuel market. 1980 should see nuclear generation accounting for 400 billion kwhr, on about 12% of total output.

But perhaps more interesting in the long run is the amount of the nation's total energy requirements which will be converted to electric energy. Today, about 20% of the nation's total demand for energy is in the form of electricity. But electricity will be taking a constantly growing share. By 1980 it will account for 37% of the nation's energy; 42% in the year 2000.

This figure gives a quick, thumbnail sketch of the future of the industry. In a nation which needs more and more energy, the electric industry is the growth supplier. No wonder sales in every category are going up with no down-turn in sight.

ELECTRICAL WORLD FORECAST IN FIGURES

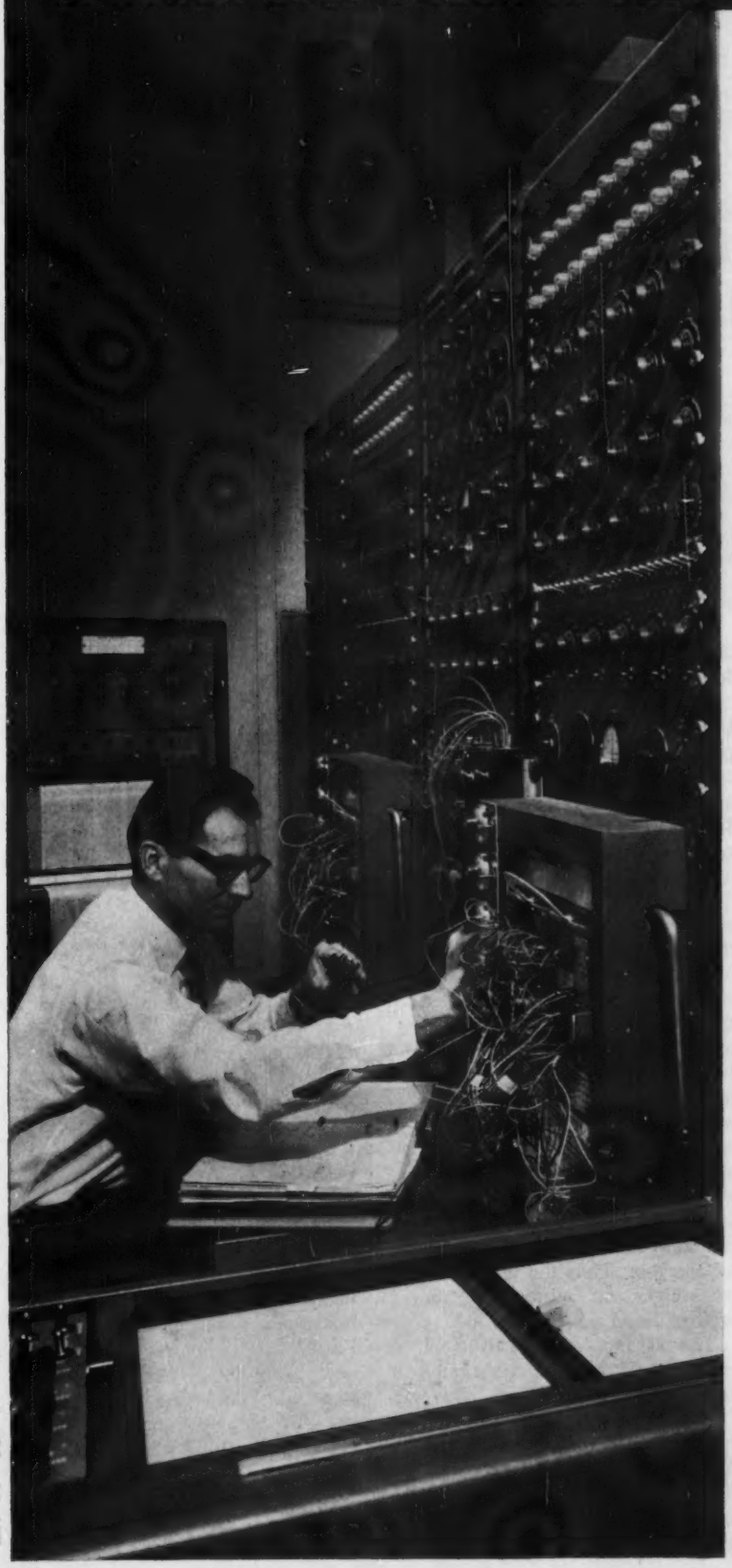
	1955	1956	1957	1958	1959	1960	FORECAST 1961	1962	1963	1964	1965	1970	1975	1980
Electric Utility Energy Sales [1,2,3] (Billions Kwhr)														
Total	479.3	528.5	556.1	567.4	626.7	681.2	713.6	775.7	845.2	905.3	983.9	1438.8	2049.8	2914.0
Industrial	257.9	285.8	291.9	283.8	312.6	344.1	348.0	382.1	420.2	446.3	485.8	699.1	956.8	1309.8
Residential	125.4	139.0	152.6	164.8	180.2	195.6	209.7	225.7	244.0	263.9	287.8	435.2	650.6	964.0
Commercial	76.3	82.9	90.0	96.0	109.0	114.4	127.1	137.3	148.3	160.2	173.0	254.0	373.1	548.1
Other	19.7	20.8	21.6	22.8	24.9	27.1	28.8	30.6	32.7	34.9	37.3	50.5	69.3	92.1
Street & Highway Lighting	4.4	4.7	5.1	5.5	5.9	6.1	6.5	7.1	7.7	8.4	9.2	14.0	21.2	32.2
Other Public Authorities	10.2	11.0	11.8	12.8	14.2	15.6	16.9	18.2	19.6	21.1	22.8	31.2	42.7	54.5
Railway & Railroad	4.6	4.4	4.1	3.8	4.1	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Interdepartmental	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Peak Loads & Capability [1,2,3]														
Winter Peaks (Millions Kw)	101.1	105.7	110.1	116.9	125.4	133.0	145.0	156.6	168.3	180.6	192.3	276.0	393.0	558.0
Load Factor (%)	62.5	65.4	66.1	63.7	65.5	65.5	63.5	64.5	65.9	65.9	67.3	68.7	68.8	69.0
Generating Capability (Millions Kw)	119.9	126.5	134.6	148.6	163.3	174.9	187.1	198.2	209.2	220.3	234.6	336.8	479.0	681.0
Gross Reserve Margin (% of Peak)	18.6	19.7	22.2	27.1	30.2	31.5	29.0	26.6	24.3	22.0	22.0	22.0	22.0	22.0
Energy Output (Billions Kwhr)	553.8	607.5	637.5	652.0	719.5	764.9	806.0	884.4	972.3	1042.3	1133.7	1661.4	2370.2	3372.7
Electric Utility Capital Expenditures (Millions of Dollars) [4]														
Total	3623	3781	4746	4906	4670	4690	4755	4891	5193	5702	6506	9272	12917	17329
Generation	1548	1479	2234	2582	2369	2226	2100	2100	2290	2626	3201	4747	6766	9091
Transmission	571	598	747	764	708	715	890	910	910	956	1041	1475	2050	2749
Distribution	1343	1518	1566	1373	1413	1565	1580	1696	1798	1906	2020	2702	3616	4839
Miscellaneous	161	186	199	187	180	183	185	185	195	214	244	348	485	650

[1] Total electric utility industry including federal agencies, municipals and cooperatives but excluding Alaska and Hawaii.
[2] Source: Historical data—Edison Electric Institute.
[3] Historical data not comparable to previously published data due to revisions by Edison Electric Institute.
[4] Source: *Electrical World's* annual surveys.

	1955	1956	1957	1958	1959	1960	FORECAST 1961	1962	1963	1964	1965	1970	1975	1980
New Capacity Additions (Megawatts)														
Total	12500	6507	7567	13264	13374	11114	11200	11200	11100	11200	14300	23412	33387	47349
Thermal	11000	5499	6288	10893	11692	9494	7374	8941	8031	10078	13160	20812	27187	36449
Hydro	1500	1008	1204	2353	1682	1620	3506	1962	2759	1100	1100	1100	1100	1100
Nuclear	0	0	75	0	0	0	320	297	310	22	40	1500	5100	9800
Industrial Use of Electricity (Billions Kwhr)														
Total Industrial Use	339.9	369.9	376.7	363.5	397.8	431.7	436.9	474.7	515.2	543.9	586.5	818.1	1121.8	1538.0
Manufacturing	263.9	280.5	288.8	280.1	307.3	340.2	348.3	385.6	421.0	447.6	486.3	703.3	997.0	1403.2
Aluminum & Magnesium	29.4	31.6	31.3	28.8	35.8	37.0	35.2	38.3	43.4	47.2	52.8	67.4	77.4	87.2
Atomic Energy Commission Purchases	46.6	57.8	56.6	54.6	54.7	54.5	53.4	50.8	50.8	49.1	47.4	47.4	47.4	47.4
Generated by Industrial Plants	82.0	84.1	84.8	79.7	85.2	87.6	88.9	92.6	95.0	97.6	100.7	119.0	165.0	228.0
Residential Use of Electricity[1,2,3]														
Customers (Millions)	45.8	47.2	48.3	49.2	50.4	51.3	52.3	53.4	54.6	55.9	57.2	64.2	71.7	79.7
Use Per Customer (Kwhr)	2774	2989	3199	3384	3618	3851	4048	4266	4511	4763	5076	6853	9163	12223
Electrically Heated Homes[5] (Thousands)	NA	NA	NA	NA	NA	920	1100	1300	1540	1820	2200	5200	12000	29000
Revenue Per Kwhr (¢)	2.65	2.61	2.56	2.54	2.51	2.47	2.45	2.44	2.43	2.42	2.41	2.40	2.38	2.36
Average Annual Bill ($)	73.51	78.01	81.89	85.95	90.81	95.12	99.18	104.09	109.62	115.26	122.33	164.47	218.08	288.46
Economic Indicators[6]														
Industrial Production Index (1957=100)	96	99	100	93	105	108	108	117	124	128	135	170	212	265
Manufacturing Production Index (1957=100)	97	100	100	92	105	108	108	117	124	128	135	170	212	265
Manufacturing Production Workers (Millions)	13.1	13.2	12.9	11.7	12.2	12.3	11.6	12.6	13.0	13.3	13.8	14.8	15.8	17.0
Primary Aluminum Production (Thousands of Tons)	1566	1679	1649	1566	1953	2014	1913	2075	2350	2550	2850	3600	4100	4600
Primary Magnesium Production (Thousands of Tons)	61	68	81	30	31	40	42	45	55	65	75	130	180	230
U. S. Population at Mid-year (Millions)	165.3	168.2	171.2	174.1	177.2	180.3	183.4	186.5	189.6	192.8	196.0	214.0	235.5	260.0
New Dwellings (Thousands)[7]	NA	NA	NA	NA	1554	1279	1300	1450	1525	1600	1650	1850	2000	2200
Households at Mid-year (Millions)	48.0	49.0	49.7	50.6	51.2	51.9	52.7	53.5	54.3	55.2	56.1	61.1	67.5	74.0
GNP (Billions 1960 Dollars)	449.6	459.1	467.6	459.9	491.0	504.4	513.0	545.0	560.0	590.0	630.0	771.0	940.0	1145.0
Disposable Income (Billions 1960 Dollars)	300.8	316.0	323.7	326.7	342.4	351.8	361.0	376.0	390.0	415.0	443.0	543.0	661.0	800.0

[1] Total electric utility industry including federal agencies, municipals and cooperatives but excluding Alaska and Hawaii.
[2] Source: Historical data—Edison Electric Institute.
[3] Historical data not comparable to previously published data due to revisions by Edison Electric Institute.
[5] Based on an *Electrical World* survey covering 1960 and 1961.
[6] Economic forecasts by McGraw-Hill Department of Economics.
[7] NA—Not available Series revised in 1959 by Bureau of Census.

ANOTHER STEP AHEAD IN VOLTAGE REGULATION



COMPUTER STUDIES BY GENERAL ELECTRIC PROVE . . .

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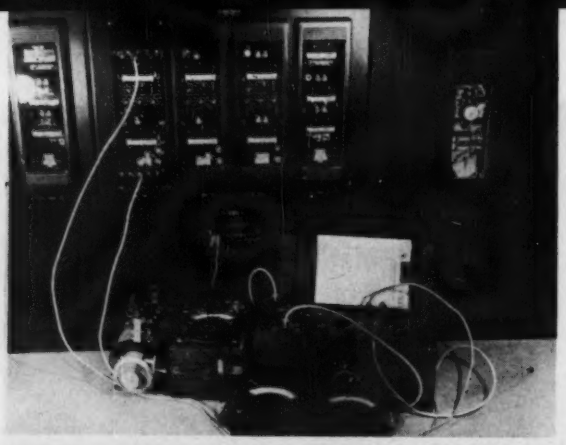
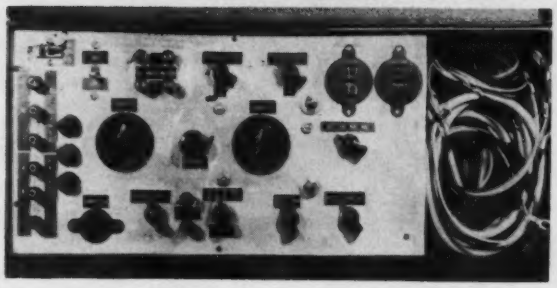
ELECTRIC UTILITY METHODS

OPERATIONS & TESTING

Speed Up Testing of Three-Phase Relays





TEST BOX contains all non-standard devices and leads for normal acceptance on periodic testing of three types of three-phase relays. Special components in test box (closeup photo) include two variable autotransformers, load box, two multi-stage switches, neon lamps and two test plugs

W. W. BRAUDT, Relay Supervisor,
C. E. LATHUM, Relay Technician,
Southwestern Public Service Co,
Amarillo, Texas

The assembly of all test equipment, except meters and a phase shifter, into a compact, lightweight test box has greatly reduced the testing time for certain three-phase relays in various substations located along the Southwestern Public Service Co. system. Although the saving in time alone more than pays for the cost of the equipment, use of the test box simplifies testing and insures consistent results through standardization of test connections.

The test box was required following the installation of Westinghouse Electric Corp types KD, KD-1 and KS relays. Test relay instruction books for these relays cover three-phase tests only, precluding the use of a standard single-phase test set. A study of test equipment for these relays showed that two basic groups of devices are required: Group I includes an ammeter, voltmeter, 200-va phase shifter, and phase-angle meter; Group II consists of two 200-va variable autotransformers, load box, four-circuit two-position switch, three-circuit four-position switch, neon lamp, two test plugs.

Testing of the KD-1 relay calls for an additional neon lamp circuit. For the KS relay, three load boxes are needed to plot the impedance circle. However, this test is not necessary to normal acceptance or periodic checking. It would be made only when a relay operation could not be otherwise explained.

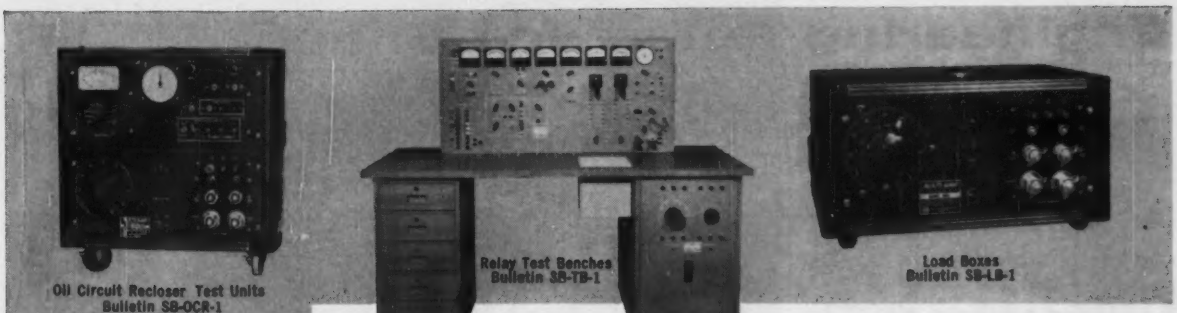
Because the objective in designing testing equipment for the three-phase relays was compactness consistent with reasonable cost and accuracy, it was decided that nothing would be gained by using special devices for the items in Group I. Rather, standard relay test devices were selected, which are still rather expensive instruments but have reasonably high accuracy. However, the weight of equipment in Group II was reduced greatly by using special components sized specifically for the job. Thus the entire test set weighs no more than an ordinary load box alone.

The test box includes all items in Group II plus an additional neon lamp for the KD-1 relay. The box is energized from a three-phase, 120-v source, available at the relaying panels and the relay test bench. The dc source needed to test the relays is provided by a rectifier in the test set. Although dc potential is available at test or relay locations, a dc source in the set eliminates need for additional leads.

All devices and leads are contained in a standard metal tool box that measures 8½ in. wide, 20 in. long, and 9½ in. deep. A handle on the cover enchances the portability of the box. The possibility of leaving a test device behind before or after testing is reduced because all components are in the box.

The test box provides the current and potential sources and makes the connections for the tests. Thus the accuracy of results is dependent only on the high-accuracy meters used. With test connections that cannot be changed, the relay technician is assured that the same connections are made from test to test.

Through use of the multi-stage switch, the box offers the flexibility of testing three types of relays merely by setting a switch. Lastly, the testing procedure has been simplified. The relay instruction books set up various tests by making connections to two buses. With multi-position switches on these buses, needed connection changes can be made by setting the switches to the indicated connection.

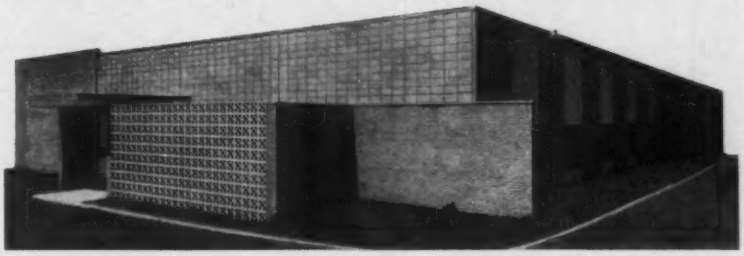


Oil Circuit Recloser Test Units
Bulletin SB-OCR-1

Relay Test Benches
Bulletin SB-TB-1

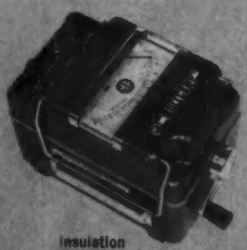
Load Boxes
Bulletin SB-LB-1

OUT OF THIS NEW HOME...

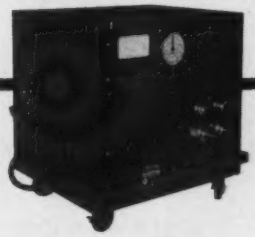


. . . will come a steady stream of standard and custom-designed dependable, portable, high-current, test units for checking electrical protective devices in the laboratory or on the line under actual operating conditions.

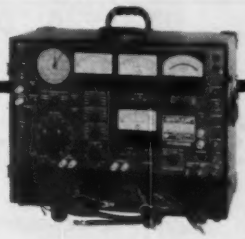
H-V Dielectric
Test Units
Bulletin SB-HVD-1



Insulation
Resistance Testers
Bulletin SB-IRT-1



Circuit Breaker Test Units
Bulletin SB-CB-1



Protective Relay Test Units
Bulletin SB-RT-1

Trailer Type Circuit Breaker
Test Units

Motor Overload Relay Test Units
Bulletin SB-MSR-1

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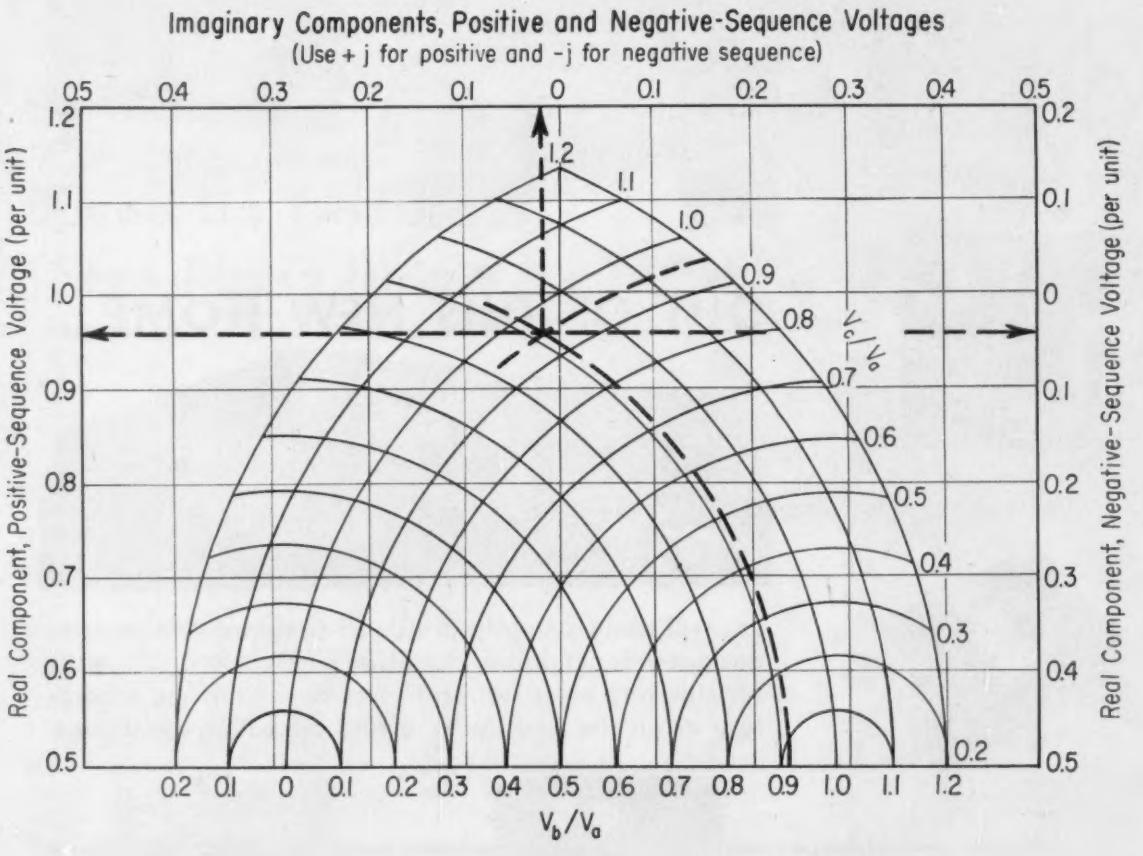

Imaginary Components, Positive and Negative-Sequence Voltages
(Use + j for positive and -j for negative sequence)
Real Component, Positive-Sequence Voltage (per unit)
Real Component, Negative-Sequence Voltage (per unit)
V_b/V_a
V_c/V_a
0.5 0.4 0.3 0.2 0.1 0 0.1 0.2 0.3 0.4 0.5
1.2 1.1 1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2

Find 3-Wire Symmetrical Components Graphically

R. A. DEWBERRY, Electrical Engineer, Montana-Dakota Utilities Co, Minneapolis, Minn.

Determination of positive and negative-sequence components of line potential of a three-phase, three-wire system is facilitated by graphical solution of the associated equations. To find the values of positive and negative components, it is necessary merely to multiply values taken from the graph by the reference voltage.

Positive and negative-sequence components of line potential of a three-phase, three-wire system are:

$$V_1 = \frac{V_a + aV_b + a^2V_c}{3} \quad (1)$$

$$V_2 = \frac{V_a + a^2V_b + aV_c}{3} \quad (2)$$

Since $V_a = -V_b - V_c$, equations 1 and 2 can be written:

$$V_1 = \frac{-V_b - V_c + aV_b + a^2V_c}{3}$$

$$= \frac{a \angle 30}{\sqrt{3}} (V_b + V_c \angle 60)$$

$$= \frac{e^{j120}}{\sqrt{3}} (V_b + V_c e^{j60}) \quad (3)$$

$$V_2 = \frac{-V_b - V_c + a^2V_b + aV_c}{3}$$

$$= \frac{a^2 \angle -30}{\sqrt{3}} (V_b + V_c \angle -60)$$

$$= \frac{e^{j240}}{\sqrt{3}} (V_b + V_c e^{-j60}) \quad (4)$$

Positive and negative-sequence components to neutral are:

$$V_{n1} = \frac{\angle -30}{\sqrt{3}} V_1$$

$$= \frac{e^{j120}}{3} (V_b + V_c e^{j60}) \quad (5)$$

$$V_{n2} = \frac{\angle 30}{\sqrt{3}} V_2$$

$$= \frac{e^{j240}}{3} (V_b + V_c e^{-j60}) \quad (6)$$

If phase A is taken as the reference and its value is 1 per unit, the per-unit values of the positive and negative-sequence components to neutral are:

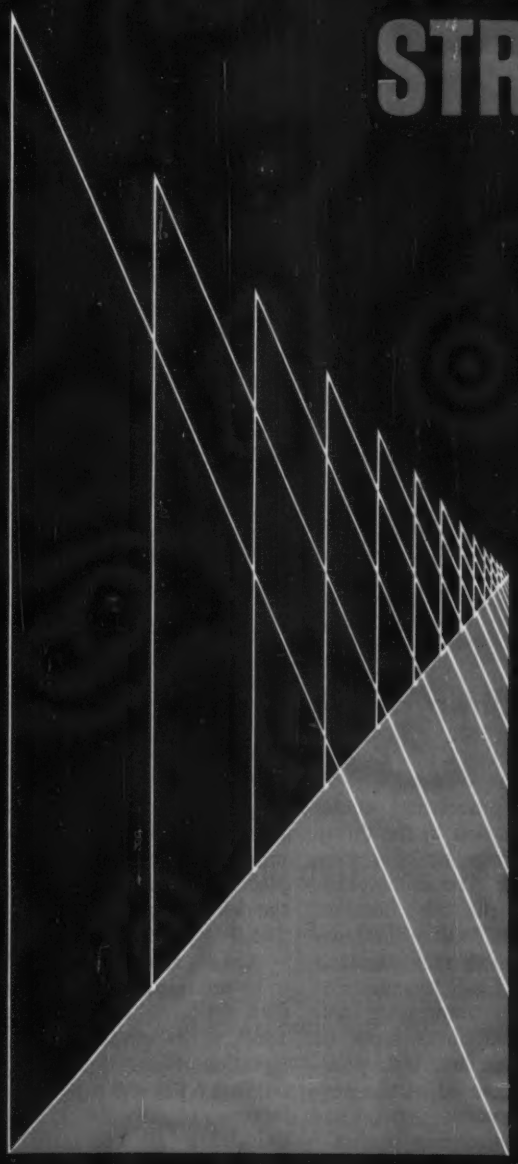
$$\frac{V_{n1}}{V_a} = pu\ V_{n1}$$

$$= \frac{e^{j120}}{3\ V_a} (V_b + V_c e^{j60}) \quad (7)$$

$$\frac{V_{n2}}{V_a} = pu\ V_{n2}$$

$$= \frac{e^{j240}}{3\ V_a} (V_b + V_c e^{-j60}) \quad (8)$$

The accompanying chart solves equations 7 and 8. To illustrate the use of the chart, assume a three-phase, three-wire circuit with measured voltages of $V_a = 220$, $V_b = 200$ and $V_c = 210$. From these voltages, $V_b/V_a = j0.908$ and $V_c/V_a = 0.954$. Entering the chart at these values gives $V_1 = 0.95 + j0.023$ and $V_2 = 0.05 - j0.023$ per unit. Therefore, $V_1 = 220(0.95 + j0.023) = 211 + j5.06$; and $V_2 = 220(0.05 - j0.023) = 8.8 - j5.06$.



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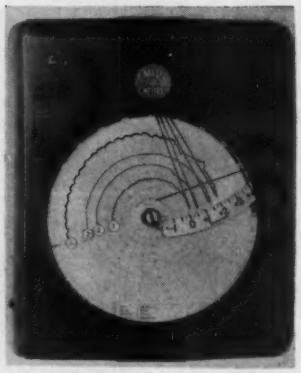
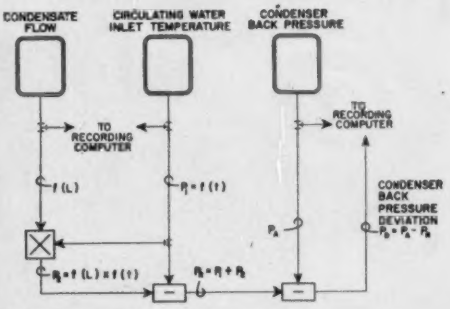
Condenser Computer Evaluates Performance

A condenser performance computer that produces continuous records of condensate flow, condenser back pressure, cooling water inlet temperature and condenser back pressure deviation for proper evaluation of condenser operation has been announced by Bailey Meter Co, Cleveland, Ohio. The Bailey 710 performance computer predicts the optimum pressure for the operating load (taking water temperature into consideration) and compares it with the actual back pressure measurement. The resultant "deviation" indication, which is independent of environmental conditions, instantaneously reveals a condenser fault.

The analog computer, in effect, plots a family of predicated condenser performance curves to determine expected condenser back pressure for the existing cooling water inlet temperature and condensate flow. Actual condenser pressure is measured and expected pressure is subtracted from actual pressure to give a deviation from expected performance.

In steam turbine plants, information is available to calculate condenser presure deviation from the temperature, flow, and pressure records. However, performance cannot easily be determined by condenser back pressure measurement alone since this pressure also varies with load and circulating water inlet temperature.





COMPUTER provides continuous records. Diagram shows computations performed

The deterioration in condenser performance which often occurs is often too rapid to be detected in sufficient time to prevent forced outage. With condenser pressure deviation immediately available on the performance computer, operators are able to take corrective action in sufficient time to return pressure to normal.

The new unit consists of four plug-in recorder servos which fit into a four-pen recorder case. The computer plots the operating point on predicted performance curves using Heat Exchange Institute data and formulae on heat transfer rates between wet steam on one side of a tube and water on the other side.

The performance computer is sensitive to changes of 0.01-in. Hg. It will record a deviation with an accuracy of plus or minus 0.05-in. Hg absolute.

SORTER-READER sorts 750 bills per min; reads imprinted data to computer

'Magnetic Imprinting' Ups Computer 'Input'

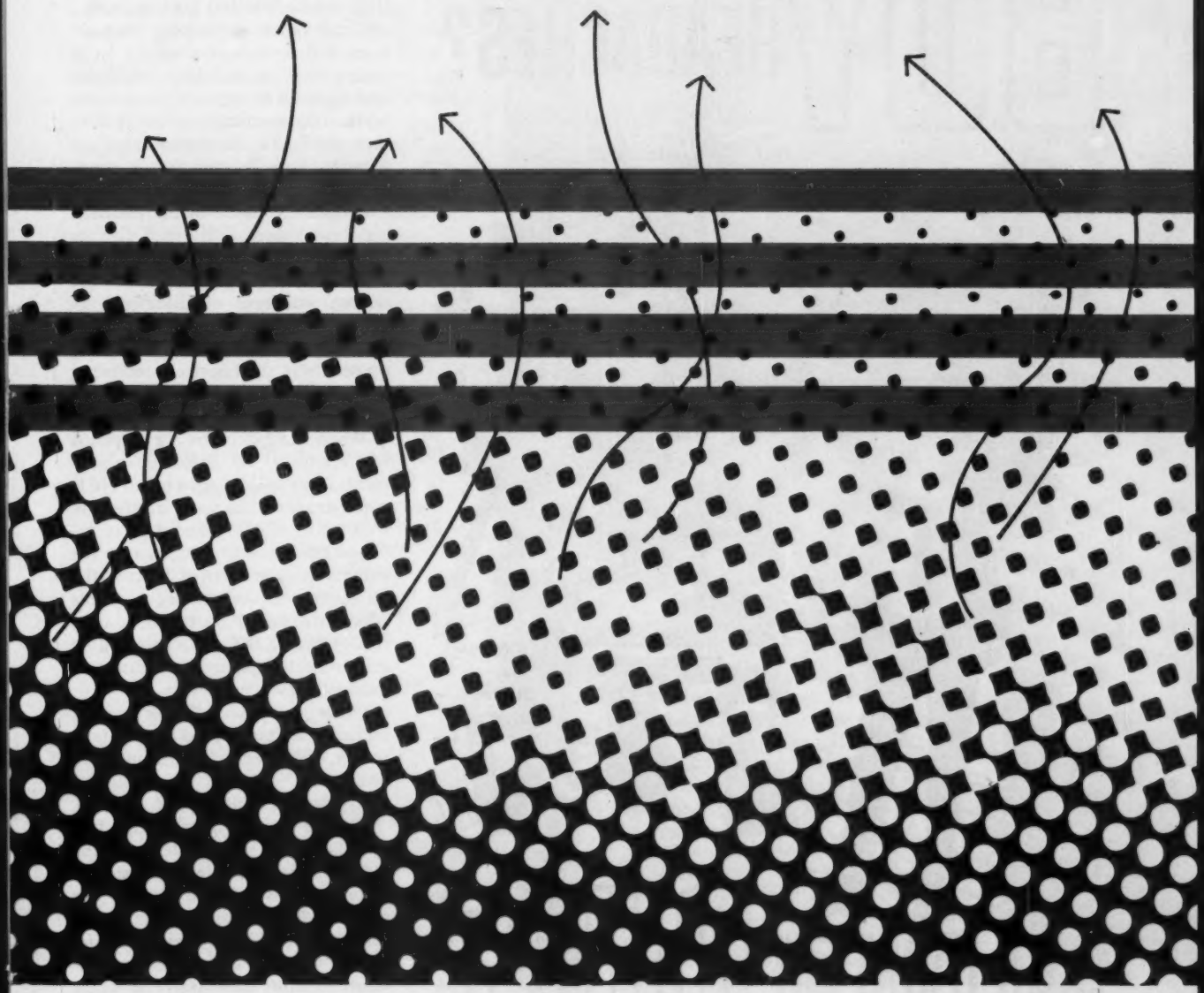
Dayton Power & Light Co has announced plans to establish an electronic data-processing center which will be the first in the utility industry to use magnetic imprinting on customer bills. The million-dollar electronic system to be installed at the center will be built around two NCR 315 computers manufactured by The National Cash Register Co. Use of magnetic imprinting will make possible the direct input of data into the computers. Data processing to be performed at the new center includes revenue, general accounting and engineering studies.

In announcing plans for the new system, James M. Stuart, president of Dayton P&L, said, "Virtually all of our record-keeping procedures will be speeded up and performed more efficiently when the center is placed in operation. This includes the calculation of bills for more than 525,000 electric and gas meters."

A key factor in the efficiencies to be provided by the system, scheduled for installation in the fall of 1962, is its unusual degree of integration, Stuart said. He pointed out that NCR will supply and manufacture not only the 315 electronic units, but all necessary auxiliary equipment for preparing media for the computer. The system will be leased by Dayton P&L.

(*Continued on page* 128)

AIR POLLUTION CONTROL



Essential consideration today—and KE is a master at it!

The two basic approaches to pollution control are control at the source, and suppression. Typical factors include effluent characteristics, plant process and layout, corrosion control, dust or particulate collection, dust handling. KE services include an independent analysis of your problems, plus complete engineering and installation of a system tailored specifically to your plant and community. KE's experience with all types of control equipment assures you an unbiased selection of equipment, resulting in an effective air pollution control system. A call from you will bring an air pollution specialist to describe what KE has done for others, can do for you. Write for brochure.

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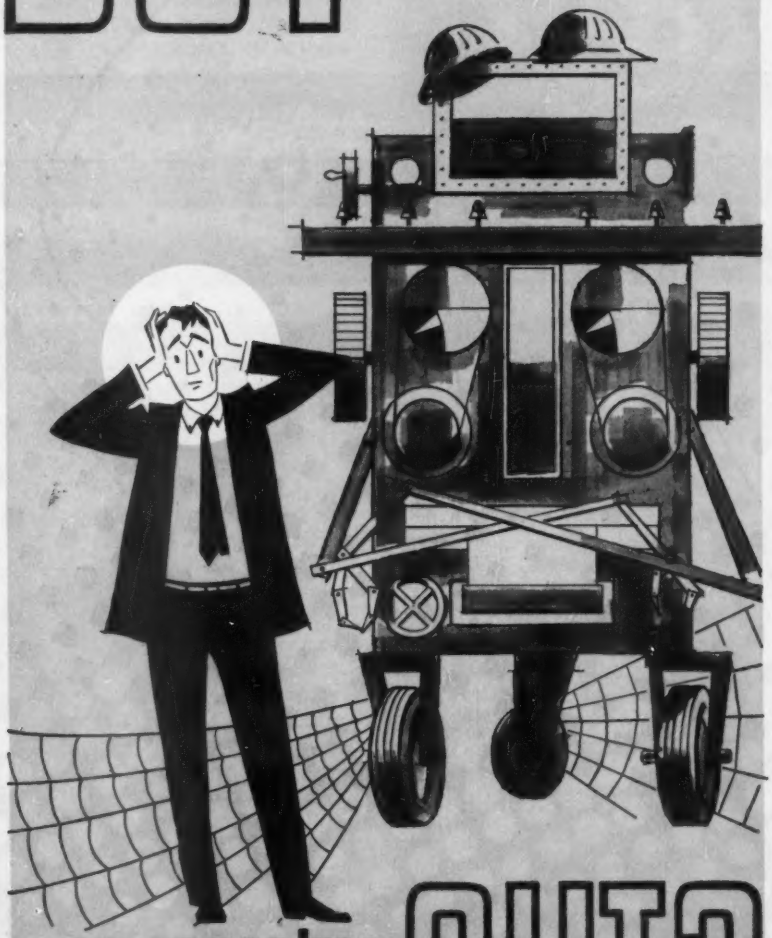
BUY HEADACHES?



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- Firm bids on job costs
- Written performance guarantees

For names and addresses of NECA qualified contractors near you, write
National Electrical Contractors Association
610 Ring Building, Washington 6, D.C.

NECA

(*Continued from page* 126)

Meter readings, new meter installations, changes of address, billings for electric and gas appliances, and all other accounting transactions will be recorded on 13 NCR desk-model bookeeping machines and eight NCR typewriter-equipped accounting machines, each linked to tape recorders. As transactions are recorded, the information is automatically punched in paper tape. The data contained in the punched tapes are subsequently read directly into the computer system.

Monthly bills for electric and gas service will have a customer's account number preprinted in magnetic ink. Miscellaneous imprinting on new bills, final notices, and other forms will be accomplished by two NCR magnetic-ink encoders.

When the bill stubs are returned for crediting of customer's payments, they will be read by an NCR sorter-reader. The sorter-reader can feed up to 42,000 characters of information a minute directly into the computer. The computer posts the payments to customer accounts which are stored on magnetic-card files. Over 15,000 payments can be electronically posted to customer accounts in 40 min.

Other equipment in the system includes a high-speed paper-tape reader, six magnetic-card memory units, two magnetic-tape memory units, and two high-speed printers.

One of the most advanced features of the new system is the method of maintaining customer records. These will be "stored" on replaceable cartridges of magnetic cards, called CRAM (Card Random Access Memory) files. Each cartridge contains 256 magnetic cards which can store over 8 million digits of information. The computer can select any card from a cartridge and read the information pertaining to a customer's account in $\frac{1}{6}$ sec.

'Engineering' Computer Planned

The magnetic-tape memory units will be used mainly to store general accounting information. Each reel of tape can record more than 14 million alpha-numeric characters. These data can be transferred to the computer at a rate of 40,000 characters a sec.

The two high-speed printers in the system are able to operate simultaneously to produce customer bills,

accounting records, and statistical and management reports. In a single hour, the printers can prepare more than 12,000 customer bills.

Some of the general accounting functions to be handled by the system include payroll, accounts payable, property and plant records, and inventory.

Eventually one of the system's most important functions would be the handling of engineering computations and studies, it is reported. This will facilitate planning by Dayton P&L engineers in the development of new electric and gas facilities to meet future area requirements.

'Super-Sniffer' Developed For SF_6 Detection

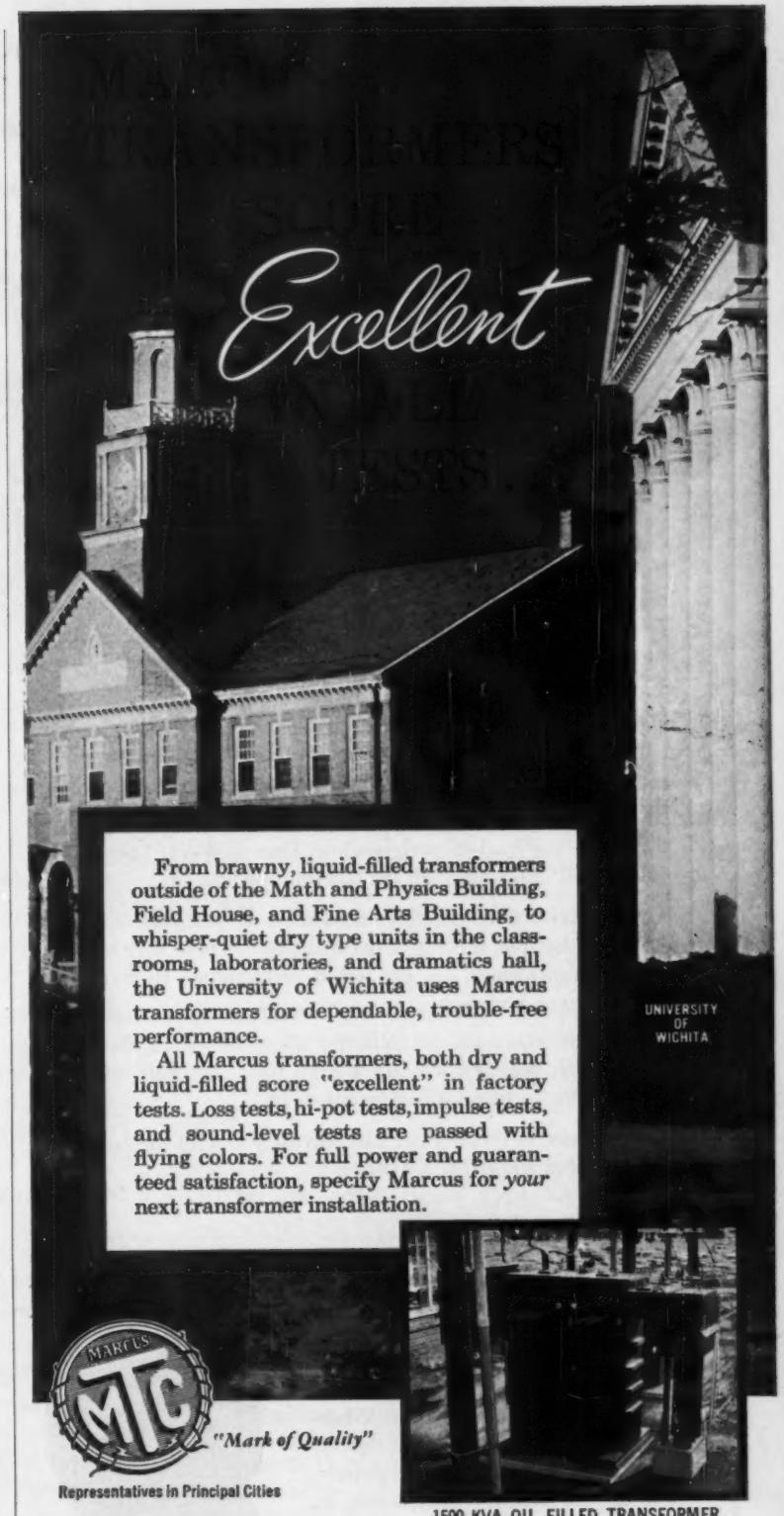
Scientists at Westinghouse Electric Corp's research laboratories have developed an electronic "sniffer" which not only detects, but exactly measures, concentrations of gases as low as one part in 10 million parts of air.

Called an electronegative gas detector (EGAD), the new instrument was developed primarily to detect and measure the concentration of sulphur hexafluoride (SF_6) gas, an inert, odorless, colorless, non-conductor of electricity.

With the growing applications for SF_6 for arc-quenching and as an insulating 'blanket' in high-voltage electrical equipment, the new detector becomes an effective instrument in the production-line testing of such apparatus, and for possible periodic checking in operation.

The new detector's sniffing ability is dependent on the inherent electron-capturing ability of SF_6. Essentially, the instrument takes in a sample of air suspected of containing SF_6, bombards it with electrons, and then is able to sort out the SF_6 because of its extra tendency to attract the electrons. When the SF_6 molecules are bombarded with electrons, they form ions. When these ions are electrically attracted to a positive terminal, or anode, they in effect lag behind other non-ionized molecular matter contained in the air sample. This time (phase)

(*Continued on page* 130)



From brawny, liquid-filled transformers outside of the Math and Physics Building, Field House, and Fine Arts Building, to whisper-quiet dry type units in the classrooms, laboratories, and dramatics hall, the University of Wichita uses Marcus transformers for dependable, trouble-free performance.

All Marcus transformers, both dry and liquid-filled score "excellent" in factory tests. Loss tests, hi-pot tests, impulse tests, and sound-level tests are passed with flying colors. For full power and guaranteed satisfaction, specify Marcus for *your* next transformer installation.

MARCUS MTC "Mark of Quality"

Representatives in Principal Cities

1500 KVA OIL FILLED TRANSFORMER

MARCUS TRANSFORMER CO., Inc.

RAHWAY, NEW JERSEY

A COMPLETE LINE OF DRY TYPE AND LIQUID-FILLED TRANSFORMERS THRU 5000 KVA

Are YOU

utilizing the advantages of

SANGAMO'S *Type BH-6* Current Transformer?

The BH-6 has received wide acclaim from the electric power industry. It leads the field in the 600 volt indoor-outdoor class. If you are not using the BH-6 . . . you should be. Why? The extra benefits!

You have a choice of three dual-range ratings (a Sangamo first) that eliminate costly transformer changeouts due to load growth. A 400/800:5 BH-6 gives high accuracy from 40 to 1600 amperes. In addition, the BH-6 is also available in four single-range ratings.

Notice the big oval-shaped window. One or TWO large conductors pull easily through the smooth opening.

And the BH-6 is completely molded in a color-coded epoxy resin . . . a durable, protective encapsulation. These lightweight, compact transformers are pre-tested and shipped to you with a certificate of accuracy.

BH-6 transformers are available for all applications; through-type, flat-bar primary, auxiliary high base, conduit or duct mounting, or in transrack assemblies.

No other current transformer can provide you with the inherent advantages of the BH-6.

The companion for the BH-6 is the new T-6 indoor-outdoor 600 volt class potential transformer. Completely encapsulated in a color-coded epoxy resin, the T-6 has 0.3 accuracy at W and X burdens, yet it is the smallest and lightest in its class as it weighs only 14½ pounds. Add up the benefits. Standardize on Sangamo transformers.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS, U.S.A.

PX61-2

(*Continued from page* 129)

delay is read at the anode by a meter calibrated directly in parts per million of SF_6.

Air is drawn into the instrument through a probe that is connected to a small air pump. The electrons which bombard the air sample are released from a sensitive surface (silver sulphide) by ultra-violet light from a 4-w lamp. Transistorized electronic circuitry completes the essential elements of the detector.

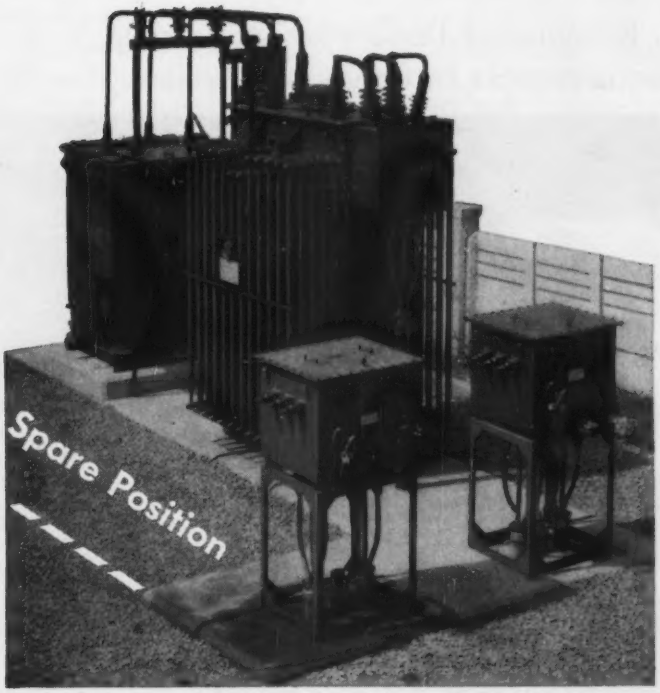
A unique feature of the new instrument is its use of thermo-electric cooling. Because excess water vapor would interfere with the SF_6 measurements, it must be partially condensed out of the incoming air sample to establish a uniform humidity level. To achieve this reference level the sniffer first passes the air through a tiny thermoelectric refrigerator, or humidistat, having one-third of a cubic inch in volume. Cooling (for condensation) from the flow of electricity through a junction of solid semiconductor materials—temperature is controlled automatically to within one-fortieth of a degree Fahrenheit. Humidity control is within 0.1%.

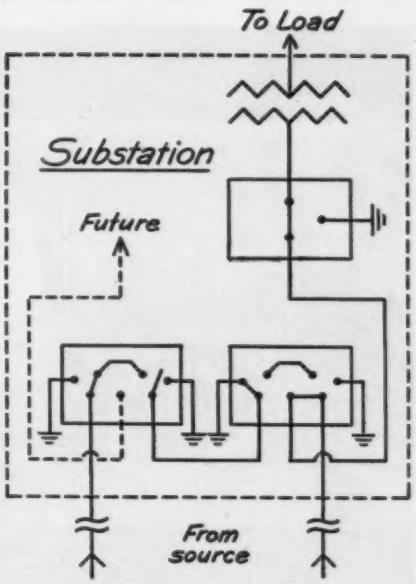
MANUFACTURERS BRIEFS

• **Weyerhaeuser Co's** (Tacoma, Wash.) Rilco division will develop 350 36-ft laminated timbers for Pacific Power & Light Co for power - line transmission - structure crossarms. They will be used on a portion of the new line linking PP&L's Willamette Valley division with the Copco division in southern Oregon.

• **Koppers Co, Inc,** dedicated its newest and largest research facility, valued at about $8½ million, at Somervell Park, Monroeville, Pa., on Aug. 28. In addition to new product research, work in areas totally new to Koppers will be conducted there. One project believed to have great promise involves the desalinization of sea water through the Koppers Hydrate Process, now in bench-scale operation. Koppers has eight other research facilities of various sizes, where product and process control, application research and pilot-plant operations are the chief projects.

Gain System Flexibility, Continuity, and Economy with G&W Type RAL Load-Break Oil Switches





Flexibility and continuity in system operation are gained by looping feeds to substations or loads. Economy, reliability, and simplicity are provided and flexibility increased when pre-engineered, standardized G&W Type RAL Load-Break Oil Switches are used to switch these loops.

Standardized Type RAL switches are engineered and built expressly for loop-through and tap circuits such as shown here. Any section of the loop can be isolated or any load or main tapped off the loop can be bypassed without affecting service to remainder of loop.

The standardized Type RAL switch is a three-way unit with tie buses for by-passing. Two lever-operated load-break Rocker Arm Links provide for looping through with or without the load connected. Optional ground positions for each of the Rocker Arm Links permit simple and positive grounding of selected cable sections.

G&W Type RAL switches are standardized which means faster and more dependable delivery as a result of assembly from factory component stock. Standardized Type RAL switches are based on components of proven performance for long, reliable service, economy, and effective operation.

Standardized G&W Type RAL switches are available in two voltage ratings, 7.5 or 15 kv. Switches will carry and interrupt full 400-ampere load. BIL and 60-cycle test voltages are equal or higher than AIEE, EEI, & NEMA.

For further information on applications, economies, and performance of G&W Type RAL Standardized Load-Break Oil Switches complete and forward the coupon.

D61-2

G&W ELECTRIC SPECIALTY COMPANY
3500 West 127th Street Blue Island, Illinois

I am interested in learning more about applications, economy, and performance of Type RAL Standardized Load-Break Oil Switches. Please send copy of STANRAL Data Sheet to–

_____

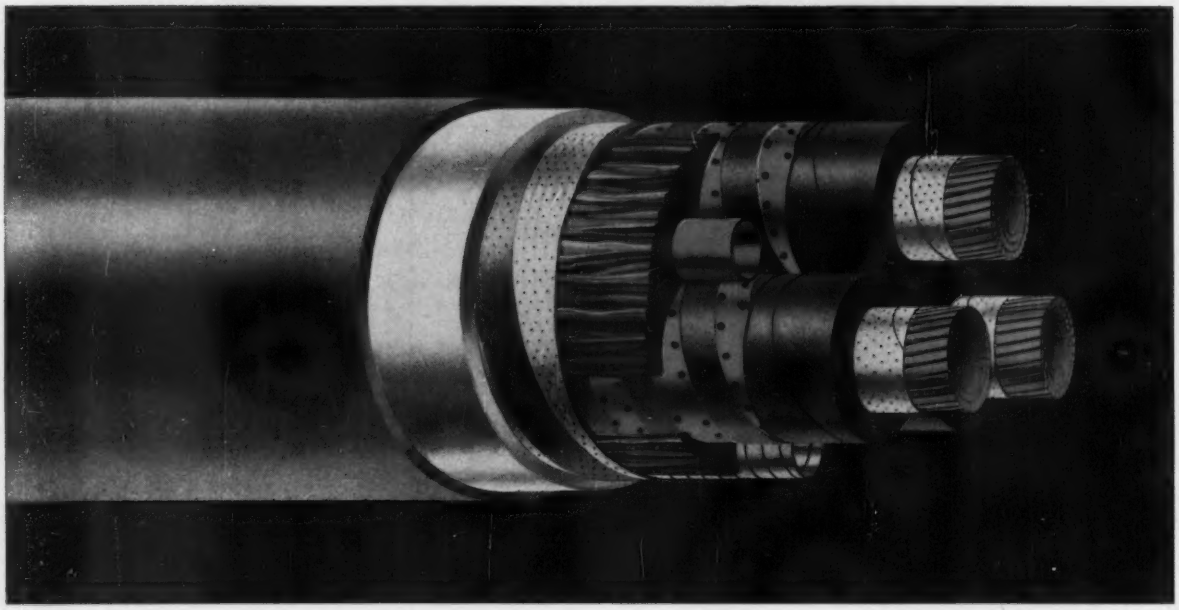
_____

_____

DEVELOPED BY PHELPS DODGE FOR THE ELECTRIC UTILITY INDUSTRY

New 69 KV High-Pressure, Gas-Filled Aluminum Sheath Aerial Cable

Provides Practical, Economical Design for Increasing Transmission Requirements in Congested Areas

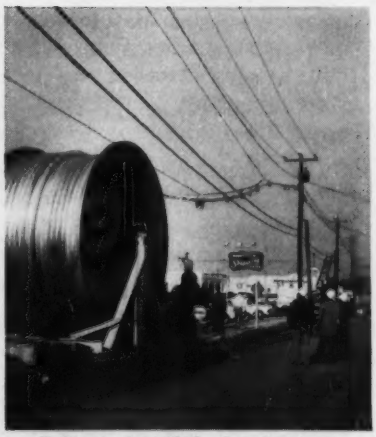


CABLE SPECIFICATION

Voltage	69 Kv.
Rating	75 MVA
Ambient air temperature	25°C
Conductor temperature, normal	75°C
emergency	90°C
Nominal shipping length	1000 ft.
Cable construction	
Three compact round conductors	800 MCM
Graded 1 to 6 mil wood pulp paper insulation	315 mils
Two steel spiral gas channels O.D.	0.760"
One copper tube gas channel O.D.	0.625"
Seamless tubular aluminum sheath	180 mils
Extruded high density polyethylene jacket	125 mils
Overall diameter	4.15 in.
Nominal operating pressure	200 psig.
Joints	Mechanical
Potheads	HPG type
Gas supply	Central Gas Cabinet

TESTING SPECIFICATION

Power factor at 90°C	below 1.0%
Ionization factor	Minimum
Sixty cycle voltage tests to ground	
Full reel	47 Kv.
Sample withstand tests,	
6 hour	107 Kv.
one minute	175 Kv.
Impulse withstand voltage test to ground (1½ x 40)	
Cable and splice	350 Kv.
Load cycle test, 60 Kv. to ground, 100°C copper	Stable



Cable was installed using aluminum blocks supplemented by periodic placement of steel blocks for mechanical strength, 69 KV cable was pulled into position from reel on trailer to messenger.

Phelps Dodge has designed and fabricated a versatile new three-conductor 69 KV aerial cable system for Long Island Lighting Co. specifically engineered for its rapidly growing suburban areas. This aluminum sheathed paper insulated high voltage power cable may be installed on distribution poles and offers the advantage of aerial cable performance at a cost substantially lower than equivalent underground cable systems. In communities with steady population and industrial growth, it meets a current need for transmitting increased electric power at high voltages where open wire systems cannot be installed.

The entire circuit includes 10,000 feet of aerially installed cable and 3000 feet of directly buried underground cable. All directly buried underground cable was provided with a high density polyethylene jacket for both mechanical and corrosion protection. Mechanical joint sleeves, developed and introduced by Phelps Dodge for use with aluminum-sheathed cable, together with installation techniques that assure dependable cable performance, were used in this LILCO project.

Other features of this advanced aerial cable are its relatively light weight and small diameter for its voltage and rating. A simple pressure control system maintains the nitrogen gas at a nominal 200-pound pressure.

The first aluminum sheathed aerial power cable installed in the United States was designed and fabricated by Phelps Dodge in 1953. Over the past years, this type cable has gained increased acceptance with utilities as an economical and practical answer to special transmission problems.

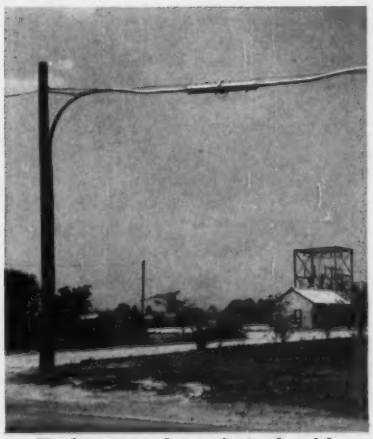
Pressurized aluminum sheathed aerial cable was first installed in this country in 1957. During that same year, design was begun on the cable system which is described here. Phelps Dodge can furnish aluminum sheathed power cable systems within a wide range of higher voltage ratings, and has designed and fabricated a 345 KV cable of this type with a capacity of 500 MVA.

For further information and engineering assistance on your particular problems, contact your local Phelps Dodge representative.

Underground portion of cable is shown in trench for direct burial. A section of underground portion was drawn thru a steel sleeve which had been driven under a heavily traveled parkway. An extruded high density polyethylene sheath was applied over aluminum sheath for mechanical and corrosion protection of underground sections.

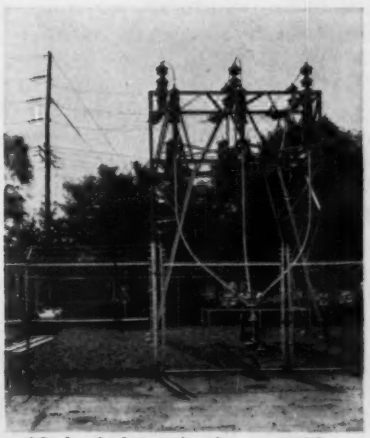
PHELPS DODGE COPPER PRODUCTS
CORPORATION
300 Park Avenue, New York 22, N.Y.

MINE TO MARKET



Underground section of cable emerges from ground in a specially designed ventilated riser, spliced to aerial section. Note neat appearance of cable, including normal joint.

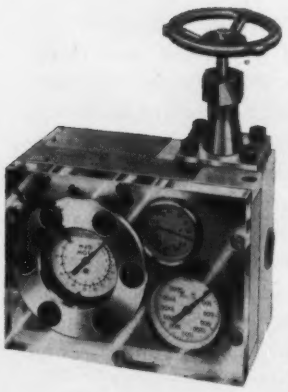
At local intersection, 69 KV cable shares poles with telephone cables, secondary and 13 KV primary. Use of aluminum sheath aerial cable overcomes objections to overhead open wire systems in communities.



Mechanical termination assembly showing both aerial and underground terminations of cable system. Termination assembly, an above ground spreader type, is fabricated completely of aluminum.

New Equipment

Hydraulic Tester . . .



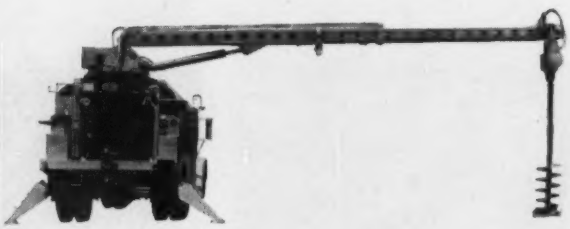
. . . quickly pinpoints problems on systems up to 3,000 psi, is portable and can be used in any position on hydraulic equipment of line trucks and aerial lifts. The Hydra-Sleuth incorporates flow, pressure and temperature gages and load valve. When the instrument is connected, hydraulic troubles show up as a drop-off in gpm on the flow gage, as working pressure is developed with the load valve. Trouble then is isolated to the pump valve or cylinder by taking flow, pressure and temperature readings on various sections of the circuit. A built-in safety blowout plug protects both the Hydra-Sleuth and the system from overloads. A high-strength aluminum block serves as case and manifold for gage porting and mounting; a heavy plexiglas cover protects gages from external damage.
Schroeder Bros Corp, McKees Rock, Pa.

Power Tools . . .

. . . cut electrical conductors: one model quickly cuts single-core ACSR for line construction and maintenance work; the other cuts through heavy copper-stranded conductors. Mechanical fittings are available for operating tools off a hydraulic power source or else from an air compressor or bottle of dry nitrogen. It is said to be particularly advantageous to use the tools from insulated buckets, operating them from the power source on the lifting mechanism. For use on or near energized lines, insulated handles are available.
A. B. Chance Co, Centralia, Mo.

Hydraulic Derrick . . .

. . . is mounted near center line of rear axle to provide maximum load capacity, stability and "down-the-road" balance. Model DO derrick is for use atop enclosed line bodies, structurally supported open-bed bodies, or flat platforms. It operates effectively to the rear, as well as both sides of the truck. Placement of the derrick—forward of rear platform—is said to cut down rear overhang leverage which tends to lift front wheels of the chassis when digging or lifting, even when hydraulic support legs are employed. With this model, truck can be moved with the derrick under load.
Utility Body Co, 1530 Wood St, Oakland 7, Calif.



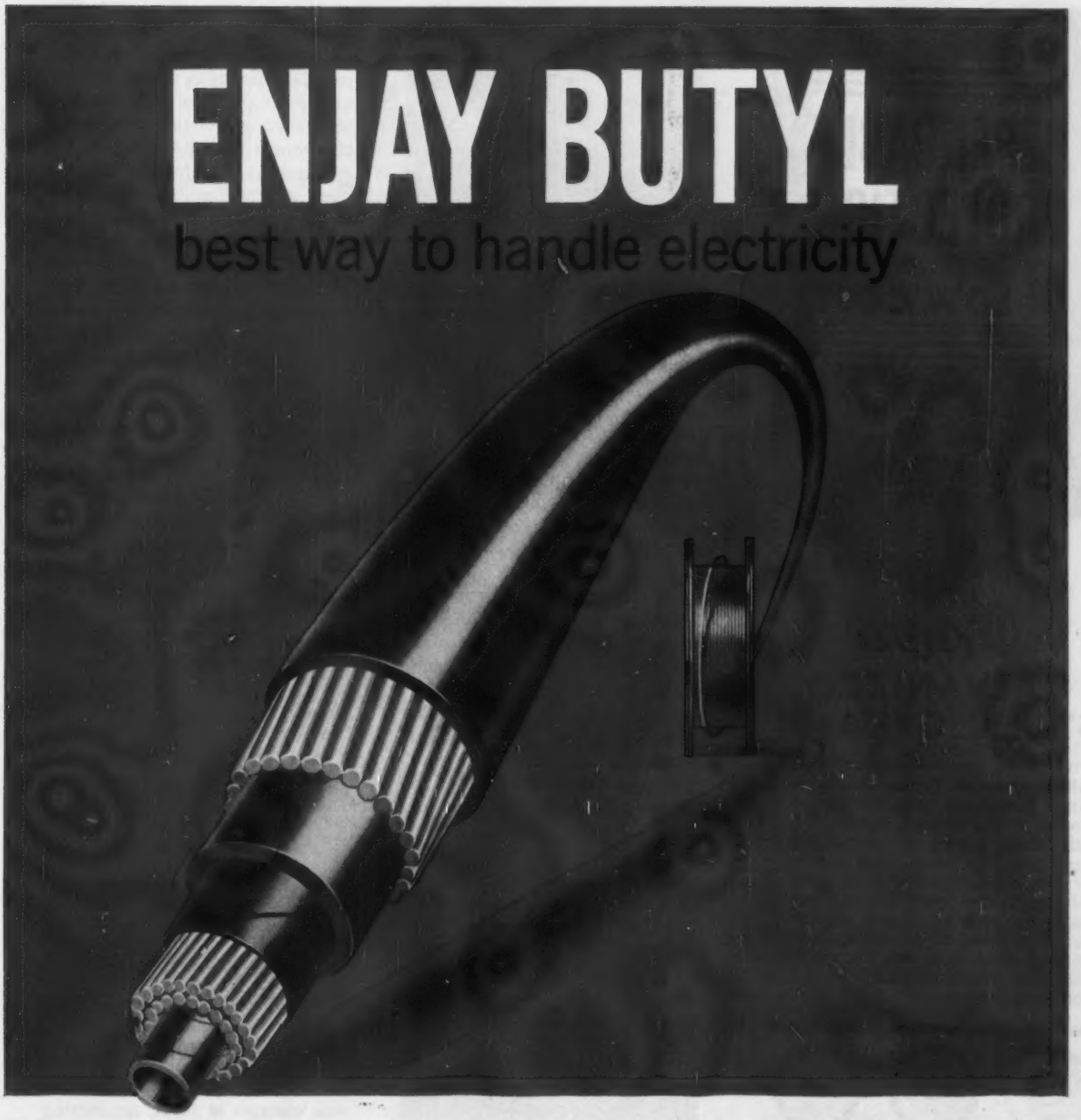
Feed Table . . .

. . . on the Asplundh Chipper is designed for easy feeding from the sides and allows smooth passage of bulky branches. As optional equipment, a blower attachment is also available. This eliminates the chute stoppage of fine brush and foliage, expedites the dispersion and discharge, and is said to be simple to install.
Asplundh Chipper Co, Chalfont, Pa.

(*More New Equipment on page* 136)

ENJAY BUTYL

best way to handle electricity



Enjay Butyl withstands all the common foes of electrical insulation — heat, water, corona, ozone, sun, weather, and high-voltage discharge. Because of its exceptional heat resistance, Butyl-insulated cable lets you carry a higher current with a given conductor size. Water absorption of Butyl insulation at 90°C is only about one-sixth that of conventional compounds, making it ideal for underground and underwater applications.

Butyl's high dielectric strength prevents excessive loss (with its resultant cable deterioration and increase in transmission cost); also guards against breakdowns due to surge currents. These characteristics have made Enjay Butyl the preferred rubber for insulation of power cable, transformers and bus bars. Coupled with outstanding abrasion resistance, these same characteristics point the way toward increased use of Butyl as a jacketing material.

For more information, write to Enjay, 15 West 51st Street, New York 19, New York.

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY CHEMICAL COMPANY

A DIVISION OF HUMBLE OIL & REFINING COMPANY

ENJAY® BUTYL

DEPENDABLE PROTECTION AT LOW COST

Crapo

GALVANIZED STEEL STRAND

The strong, tough individual wires which make up *Crapo* Galvanized Steel Strand are protected against corrosion by a uniform, tightly-bonded, ductile coating of commercially pure zinc. This heavy, dense coating of zinc, applied by one of the time-proven *Crapo* methods, not only seals out rust but further protects the base metal by sacrificing itself through galvanic action. The result: long and dependable performance at low yearly cost.

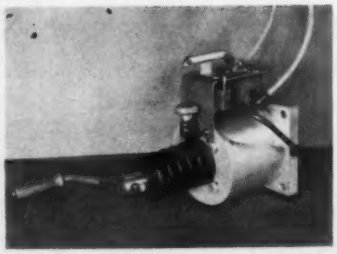
A B C

CHOOSE FROM 3 COATING WEIGHTS

Crapo Galvanized Steel Strand is available in three weights of coating, Class A, B and C. Class B has twice the zinc by weight per square foot of wire surface as Class A; Class C has three times that of "A."

Contact the *Crapo* Galvanized Steel Strand distributor near you for prompt shipments from his stock or from our mill.

INDIANA Steel & Wire Co., Inc. Muncie, Indiana



Hydraulic Operator . . .

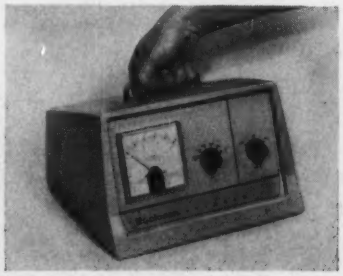
. . . opens and closes high-voltage disconnect switches manually. The hydraulic pump, operated by clockwise rotation of a crank, imparts a continuous high-pressure fluid output which insures fast switch-contact action. Operating range is 0 to 2,000-psi output. Pump can be used in conjunction with a linear hydraulic cylinder which is mounted on the switch base or with a rotating type of cylinder at ground level. It can be locked in a neutral position with a standard padlock. Unit is said to be especially suitable for installations where mechanical linkages would be difficult or costly to install because of mounting or structural problems.

Schwager-Wood Co, 8024 SW 35 Ave, Portland, Ore.

Invert Herbicide . . .

. . . may be applied from the ground, is non-drift. The 100-lb, portable unit is suitable for operation from a pick-up truck without being anchored. A special nozzle is used for distributing spray to 50 ft with pin-point accuracy; pumping output may be readily varied over a wide volume and pressure range. A 7½-hp, air-cooled, gas engine powers the component mixing—which is instantaneous, eliminating day-to-day, left-over spray mix. The bi-fluid process is accomplished with one feed line to a drum of water, the other to the special chemical formula — both connected to the nozzle where components are mixed and water, non-aromatic oil and herbicide are emulsified. Other additives include a surface active agent, an emulsifier and sticking agent. Heavy consistency of the emulsion is said to add to its clinging ability for optimum efficiency, as well as to eliminate drift while spraying. Dual triggers on the handspray have self-locking devices for constant spray and may be worked independently.

Stull Chemical Co, 3400 Nacogdoches Rd, San Antonio, Tex.



Moisture Meter . . .

. . . rapidly detects minute moisture changes in gases, monitoring water vapor continuously in ppm ranges of 0-10, 0-30, 0-100, 0-300, and 0-1,000, at sample flow rate of 100 cc per min. Sample pressures of the Hygromite meter are 10 to 100 psig, with accuracy of ±5% of full scale in any of the ranges. The meter can be operated either from ac power or with its own battery power supply. Weight of the meter, encased in high impact-resistant plastic with a built-in carrying handle, is 11 lb.

Beckman Scientific & Process Instruments Div, 2500 Fullerton Rd, Fullerton, Calif.

SOLID!
Section of Roebel bar for 22,000 Volt, 76,000 KVA turbogenerator stator.

The outstanding insulation for high voltage coils

NECCOBOND...solid insulation bonded to the copper provides longer life, greater strength and stability

In NECCOBOND, National has developed a complete insulation system, using mica, glass and a special impregnant. Its particular advantages for high voltage coils are:

- Exceptional thermal stability.
- Optimum mechanical and electrical properties.
- High heat conductivity.

NECCOBOND is based on time-proven insulating materials – mica and glass. These are welded by a special impregnant into a tenaciously bonded, resilient, voidless insulation wall. A unique method of fabrication assures homogeneous insulation.

When replacing high voltage coils, investigate the long term savings with NECCOBOND. You'll find our advice impartial–we offer all types of insulation.

For more information, call National's Columbus Plant . . . HUdson 8-1151. Or call your nearby National field engineer.

NATIONAL COILS

National Electric Coil

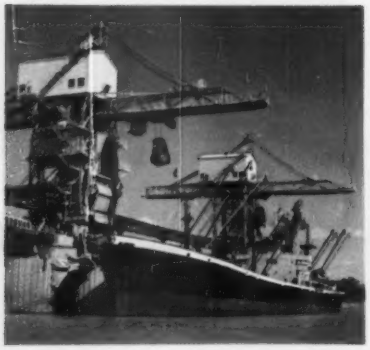
COLUMBUS 16, OHIO • IN CANADA: ST. JOHNS, QUEBEC

DIVISION OF McGRAW EDISON

How Dravo serves utilities

MATERIALS HANDLING

New 800-ft. multi-purpose dock and twin unloaders service both ships and barges at a 2,000 ton-per-hour rate. Check coupon at right for information on Dravo's bulk material handling equipment and economical cellular docks.

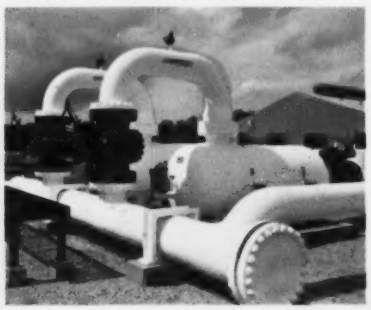


GENERATING STATIONS

In addition to large conventional and nuclear generating stations for public utilities, Dravo has built numerous smaller scale stations for industrial plants. Intakes and foundations for such installations are also Dravo specialties, as well as fabrication and erection of station piping, including nuclear applications. Mail coupon for more details.

CONSTRUCTION

This compressor station is one of many contracts performed on a turn-key basis. Process, air separation and boiler plants, slopes, shafts, water pumping and treating facilities are part of Dravo's specialized experience. Mail coupon at right for more information.



High pressure piping being removed from heat treating furnace in Dravo's modern pipe fabrication plant.

GRATING

Tru-Weld steel grating for floors and stairways is produced in one of the nation's most modern facilities. Aluminum grating can be furnished where weight or atmospheric conditions require. Engineering, design and layout services are available for installation requirements. Mail coupon for complete details.

TOWBOATS AND BARGES

New high speed 3200-hp towboats, operating in petroleum trade, typify the variety of marine units produced yearly. Dravo has launched more than 4,000 towboats, barges, tugs, dump scows, derrick boats, dry docks, other marine units. Mail the coupon for information.

Dravo Corporation, 4763 Grand Avenue, Pittsburgh 25, Pa.

Please send me information on the following products and services

☐ Sinter & Pelletizing Plants	☐ Foundations	☐ Fabricated Piping
☐ Pumping Stations & Intakes	☐ Grating	☐ Container Cranes
☐ Sewage & Water Treatment	☐ Space Heaters	☐ Pelletizing Discs
☐ Coal & Ore Unloaders	☐ Shafts, Slopes	☐ Process Machinery
☐ Compressor Stations	☐ Oxygen Plants	☐ Steam Plants
☐ River Transportation	☐ Docks, Harbors	☐ Towboats & Barges

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

DRAVO

Promotion Gimmicks Help Build Co-op Load

BULK MILK coolers are financed for member-consumers by Petit Jean Electric Cooperative. Forty-seven milk producers have installed coolers on lines

Cash allowances to customers on the purchase of major appliances and cash bonuses to electric appliance dealers when they sell appliances to co-op customers are two tools that are being used effectively by Arkansas REA cooperatives to build load and boost revenues. Another tool that has put money in the till has been the financing of major equipment at a simple interest rate of 4%. Arkansas' cooperatives have also installed ranges, automatic washers, automatic clothes dryers, water heaters and food freezers in many of the home economics departments of high schools in their areas to teach future home-makers the advantages of, and how to use, electrical appliances. Pole light rental programs have also been effective revenue builders.

Cash certificates are sent to member-consumers either by a direct mailing or by printing them in the monthly publication, "Rural Arkansas Magazine." These certificates are good for a cash allowance on a major appliance, as specified on the face of the certificate, when presented to the electrical appliance dealer at the time of the purchase of an appliance. The cooperative redeems certificates only for member-consumers on its own lines. If a customer comes to an electrical dealer's store without a certificate, the dealer will supply it.

With such a program the Craighead Electric Cooperative added 648 major electrical appliances to its lines, including 336 home freezers, 81 air conditioners and 266 refrigerators. This amounted to an average of one major appliance added on 4% of Craighead's meters and an additional load of 500,000 kwhr per year.

Pay Dealers a Bonus

To stimulate further interest on the part of appliance dealer personnel, the Arkansas Valley Electric Cooperative of Ozark, Ark., paid a dealer sales bonus of $5 for each of several appliances sold to member-consumers from May 15 to July 31. The sales bonus implements the cash certificate program which pays the customer $20 toward the purchase of a food freezer or combination refrigerator - freezer having a freezer capacity of 100 lb or more, and $10 toward the purchase of an air conditioner or refrigerator.

Realizing that the cash certificates simply encourage those sold on an appliance to buy now, the dealer sales bonus was added to stimulate dealers to get out and sell rather than sit and wait for the certificates to be brought in. To qualify for the $5 sales bonus the appliance dealer must furnish Arkansas Valley Electric proof of product advertising with tie-in advertising on the cash certificate program. Arkansas Valley furnishes dealers with "drop-in" advertising mats at no charge. The co-op also runs advertising on the cash certificate program in all newspapers in their area. The appliance dealers who furnish proof of "tie-in" advertising will have their names listed in Arkansas Valley's ads at no cost to the dealers.

Final results are not available but during the first 15 days of the program the cooperative redeemed 75 cash certificates and a lag between appliance sales and the redeeming of the certificates is expected. Arkansas Valley has 12,300 meters.

Finance Appliance Sales

Low-cost financing is being made available by many cooperatives in Arkansas to stimulate the sale of electrical appliances.

As an example of how this type of financing works the Petit Jean Electric Cooperative, Clinton, Ark., initiated their consumer-loan program in 1955. To date slightly over 4,500 loan contracts have been made to their 5,300 members totaling slightly under $1 million. These loan contracts were made through 23 approved dealers and were on electrical appliances or equipment with a selling price of over $25. The contracts can run up to 36 months at a simple interest rate of 4%.

Equipment is financed with recourse on the dealer. To date, no money has been lost by Petit Jean and all payments are current. The cooperative furnishes the member with a book of coupons specifying the amount of each monthly payment which is paid to the cooperative with their monthly electric bill.

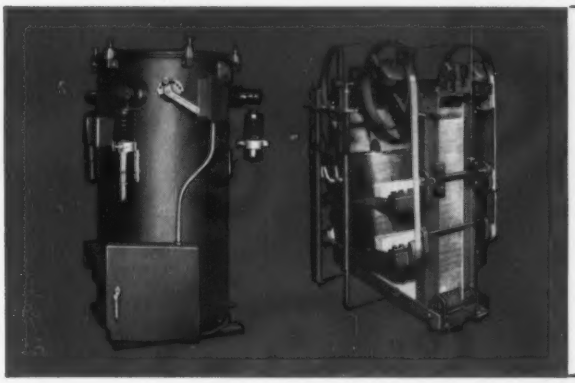
The program has been particu-

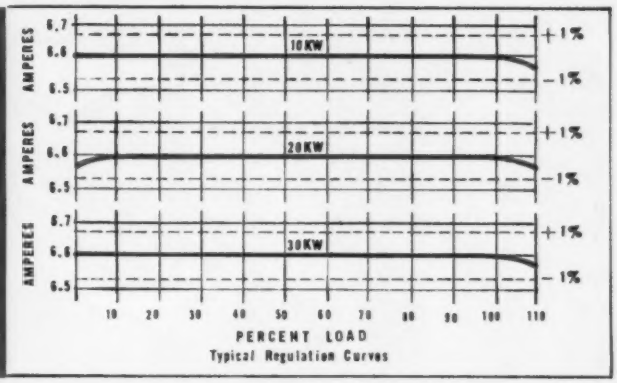
(*Continued on page* 144)

SPECIAL REPORT

ON SERIES STREET LIGHTING TRANSFORMERS

Moloney's Well Balanced Design For Constant Current Transformers Provides Fast, Excellent Regulation With Its Exclusive Double-Moving-Coil Construction



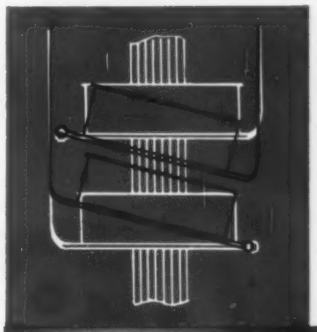


Typical Regulation Curves

Excellent regulation curve is due to the well-balanced design of Moloney's Double-Moving-Coil construction. Coils remain parallel to each other under all conditions of load.

Users of Moloney Constant Current Transformers benefit from the excellence of regulation under all conditions of load. This excellence of regulation stems from the exclusive Moloney Principal of Double-Moving-Coil Design. Response to current variations is faster and smoother. Coils stay parallel at all times as they move closer together or farther apart in response to circuit changes. Result: excellent regulation curve . . . less severe shocks due to short-circuit conditions.

Moloney Constant Current Transformers are available in ratings up to 70 KW. Standard rating from 5 to 30 KW. Available in Pole, Platform, Subway or Station Types and in oil, askarel or air-cooled types, depending upon the need. Additional, exclusive Moloney design features are described at right. For complete information concerning Moloney Constant Current Transformers, contact your nearest Moloney representative or write for Bulletin SL-703.



The exclusive Moloney Principle of Double-Moving-Coil Design permits quicker response to starting loads or changes in load, because each coil moves in ever parallel position away from, or to the other coil moving only half the distance required in single-moving-coil types of regulators.

The exclusive external adjusting mechanism permits small changes in secondary current without opening the tank.

ME61-12

MOLONEY ELECTRIC COMPANY

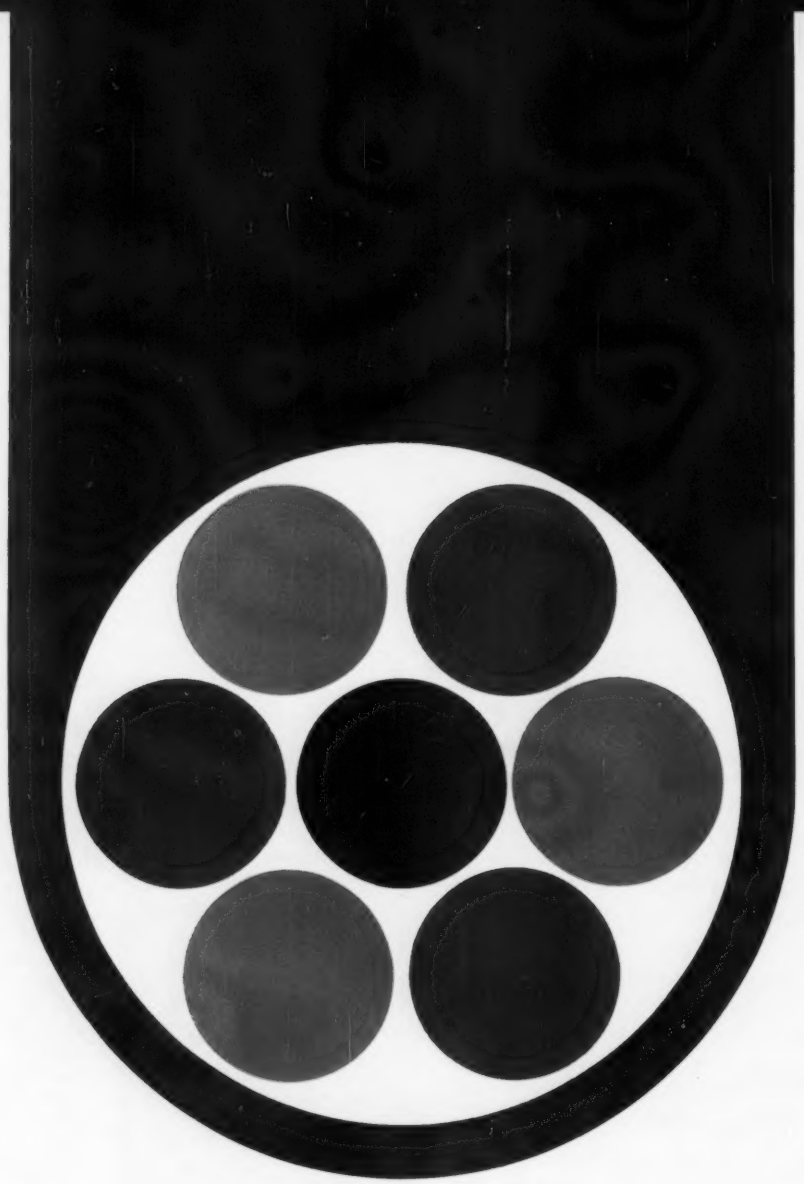
Transformers for

SALES OFFICES

ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

Utilities, Industry and Electronic Applications

IN ALL PRINCIPAL CITIES

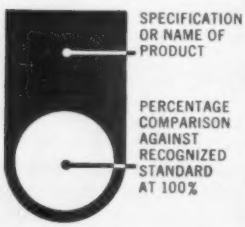


NEW WAY TO EVALUATE CABLE!

"VALUE RATINGS" RELATE PERFORMANCE TO IPCEA OR COMPETITIVE STANDARDS

New Value Ratings tell at a glance the composite story of each Kaiser Wire construction—as it performed in as many as 25 specified tests. In each case a well-known standard serves as 100%:

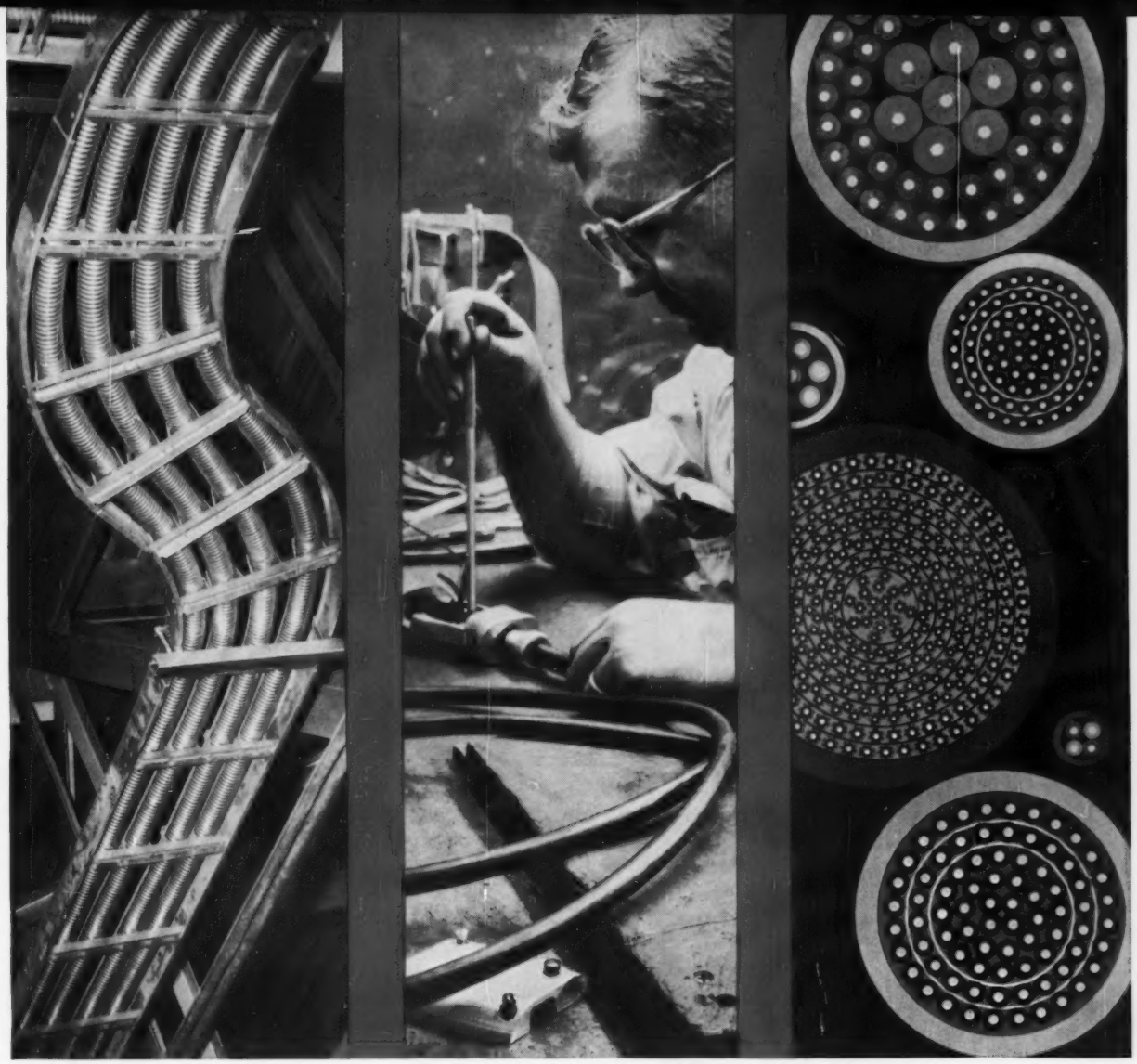
For power cable, the Value Rating standard is all IPCEA test requirements for types of insulation and jacketing specified . . . For portable cord, the standard is service-per-dollar for the least expensive cord (C.V.) as proved by life-expectancy tests. . . . For control cable, the standard is a composite of minimum requirements for eight important insulation qualities.



Compared to these standards, Kaiser Wire constructions earn Value Ratings as large as 767%—valid proof that the spark of quality is Kaiser Wire experience.

For details and Value Rating listings, ask your Kaiser Wire Distributor for free K/W Value Rating Bulletins, or write: Kaiser Wire, Room 844f, Kaiser Aluminum & Chemical Sales, Inc., Kaiser Center, 300 Lakeside Drive, Oakland 12, California.

KAISER ALUMINUM & CHEMICAL CORPORATION



KAISER INTERLOCKED ARMOR CABLE DISTRIBUTES POWER AT LOWER COST

It needs no conduit for protection. It is flexible, forms easily. And because of its light weight, K/W Aluminum Interlocked Armor Cable cuts installation costs. One hundred feet of this aluminum-armored cable in unshielded 5KV, 3-cdr, size 1/0 AWG, weighs only 125 lbs. compared to 234 lbs. for size 2, copper-conductor steel-armored. K/W aluminum-armored is corrosion resistant . . . and its insulation has nearly 20 times the ozone resistance required by IPCEA.

K/W ALUMINUM INTERLOCKED ARMOR CABLE
VALUE 363% RATING

KAISER PORTABLE CORD SAVES $22.24 IN ONE TOOL'S REPAIRS

A typical case shows how K/W Master Laytex portable cord can save $22.24 in maintenance—before a single repair. A new length of K/W Master Laytex cost the buyer $4.65; plus an estimated $6.00 labor to connect it. An equal length of "bargain" cord (low-priced C.V.) cost $2.89. But the latter was in and out for repairs five times—running up $30.00 labor—before K/W Master Laytex failed once. The net saving was $22.24 with K/W Master Laytex cord.

K/W MASTER LAYTEX PORTABLE CORD
VALUE 308% RATING

KAISER CONTROL CABLES OFFER WIDEST CHOICE OF INSULATIONS

Kaiser Wire offers the following broad range of control cable insulations . . . Thermoplastics: Polyethylene, Polyvinyl Chloride. Synthetic rubber: Pyrosec® (SBR), Hydrosec® (SBR), Oil base, Kalzone® (butyl), Silicone. Natural rubber: Kaiser Laytex®, the patented liquid latex covering unequalled for strength and dielectric qualities. Add neoprene or plastic jacketing, copper or aluminum conductor—and you can choose from hundreds of K/W cables of extra value!

K/W LAYTEX-RESIN CONTROL CABLE
VALUE 767% RATING

IN COPPER AND ALUMINUM CABLES . . . THE SPARK OF QUALITY IS KAISER WIRE EXPERIENCE! KAISER ALUMINUM

HOW GOOD IS...
AN IMITATION Amp-trap®?

Amp-trap®

VS IMITATIONS

Amp-traps are *our* products. We originated and developed them. We alone manufacture them. They are so good that others are now imitating them. This is flattering because it indicates Amp-trap is superior. But, don't be confused by imitations.

Amp-trap®

VS SUBSTITUTES

"Just like Amp-trap." "As good as Amp-trap." "Works like Amp-trap." "Better than Amp-trap." These are the deceptive phrases that imitators must use. Without them they can neither explain nor sell their substitutes.

NOTHING TAKES THE PLACE OF

Amp-trap®

Whenever you *need* Amp-trap, you *want* Amp-trap — not an imitation or a substitute. Amp-trap is a very special current limiting device with high interrupting capacity. Regardless of claims, imitations aren't enough. More than 27 patents prove it. *Nothing takes the place of Amp-trap!* For your own protection specify Amp-trap. Then — make sure you get it.

REGISTERED UNITED STATES PATENT OFFICE Est. 1893

Amp-trap® – "Awake At The Switch"

THE **CHASE-SHAWMUT** CO.

374 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

Subsidiary of I-T-E CIRCUIT BREAKER CO.

Amp-trap® Tri-onic® td C-O-T® TRIONIC® ONE O-T TYPE

Selling

(*Continued from page* 140)

larly helpful to co-op members in financing milk cooler installations. With a recent requirement of bulk tank milk coolers for all Grade A milk producers in the area, 47 milk producers have borrowed over $100,000 to change over to this type cooler. The bulk tank milk coolers can be financed by Petit Jean Electric over a period of up to five years.

It is difficult to say just how much the loan program affects load growth, but Petit Jean Electric Cooperative has increased its load 2.3 times since their consumer loan program was initiated five years ago.

Sell for the Future

"Let 'em learn electrically" and they will live electrically is the philosophy behind the program whereby 12 Arkansas electric cooperatives installed 91 electric ranges, 73 automatic washers, 73 electric clothes dryers, nine food freezers and six electric water heaters in the home economics departments of high schools where their members' children attend school. In school districts served by both an electric cooperative and a power company, they jointly installed the equipment in the departments with the number of appliances furnished by each pro-rated according to the number of meters served in the school district.

A survey showed that of the 305 home economics departments reporting, 50 did not have an electric range and in half of the departments with electric ranges the ranges were over five years old. The survey further showed that in these departments there were only ten electric clothes dryers, and 39 automatic washers available for training purposes. So, some type of school appliance installation program was much needed.

The program has resulted in making modern electric ranges, washers, and dryers available for teaching purposes in the home economics departments of almost every high school in the state.

Now that equipment is available to them, the home economics teachers can teach the advantages, care and use of these electric appliances not only to the future homemakers,

(*Continued on page* 164)

WHAT ELSE IS DIFFERENT ABOUT NEW HYPALON® DROP WIRE?

Color is the first thing you'll notice when you see this new multiplex service drop wire covered with HYPALON synthetic rubber. Why color? It can mean easier size and phase identification, simpler warehousing, speedier line identification, accurate hook-ups.

But non-fading color is only one of the many differences you'll find in HYPALON covered drop wire.

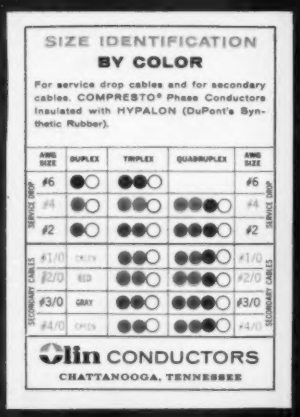
HYPALON's resistance to sunlight, weather and ozone is unmatched by any other drop wire covering. Because HYPALON is an elastomer, it resists compression cutting, hot and cold flow . . . remains flexible at low temperatures. What's more, HYPALON is flame resistant. It's a material specifically tailored to meet the needs of drop wire covering.

New HYPALON covered service drop wire is now available in duplex, triplex and quadruplex constructions and in sizes to meet most requirements. For more information about HYPALON and its growing use in other electrical applications, write E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Department EW-9, Wilmington 98, Delaware.

DU PONT

HYPALON®
SYNTHETIC RUBBER

Better Things for Better Living . . . *through Chemistry*



FREE! Large self-adhesive Size-Identification Color-Chart...See below

Now measure wire by color!

Olin Conductors—creators of color for secondary cable over a year ago—now announce another industry "first": SIZE IDENTIFICATION BY COLOR in service drop cable!

Olin Conductor's COMPRESTO® has been combined with DuPont HYPALON* to create a "one shot" 600 volt insulated jacket that has insulation resistance values consistent with that usually found only in regular TWO-COAT type service drop cables.

Because of its superior natural resistance to weather, oxygen and ozone, colored Hypalon covering does not require large quantities of carbon black. Thus, Compresto size-by-color service drop may be colored with industry accepted—lasting—color coding, without damage from the sun's ultraviolet rays. In fact, Compresto with Hypalon in color has a longer life—weathers better—than the best grade of black in any other commercially available compound!

For a free self-adhesive Size-Identification Color-Chart suitable for use in warehouse or service truck, simply mail the coupon below to Olin Conductors, P. O. Box 989, Chattanooga, Tennessee.

Now COLOR Tells The Size—

	BLACK	RED	GRAY	GREEN
AWG Size	#6	#4	#2	#1/0
AWG Size		#2/0	#3/0	#4/0

Olin CONDUCTORS

METALS DIVISION, OLIN

P.O. BOX 989 • CHATTANOOGA, TENN.

Please send free of charge _____ Olin Size-Identification Color-Charts. (indicate number)

NAME _____

COMPANY _____

STREET _____

CITY _____ STATE _____

OHIO BRASS MANAGEMENT REPORT

OUR RECIPE FOR A GOOD NIGHT'S REST: NEVER CUT TOO DEEP

BY GEORGE L. DRAFFAN
CHAIRMAN, OHIO BRASS COMPANY

We recently held a series of meetings for salaried personnel—sales, engineering, factory—in which we discussed ways to improve further our service to utility customers. Purchasing executives from two nearby power companies were good enough to spend time with us, offering many constructive comments. Both men stressed that they did not consider price the only measure of service and value. But they stated forcefully that adding cost to a product does not necessarily add value.

IN AN EXAGGERATED BUT EFFECTIVE demonstration, one man smashed a kitchen clock on the floor (it was his clock, not ours). His point: if such an operation were performed on a production line, it would not only waste labor and add to cost but would actually detract from value.

Among many contributions made to our industry by the utility buyer is better understanding of product value. At Ohio Brass, this understanding has prompted us to review our many designs and to make changes but only when we could be sure that reliability would not be sacrificed.

HOWEVER, WE HAVE NOT CHANGED A FUNDAMENTAL POLICY of always providing safety and quality features which are comfortably adequate for the intended applications. Certainly, we try to eliminate unnecessary cost. But if there is any doubt about a quality feature, we leave it in. We never cut too deep. When price is the primary consideration in the buyer's mind, this may put us at a competitive disadvantage. But we sleep easier.

Industry standards offer some guidance in measuring product value. But many power companies think standards are too low; some think they're too high. This shows that standards are too broad for finite measurement.

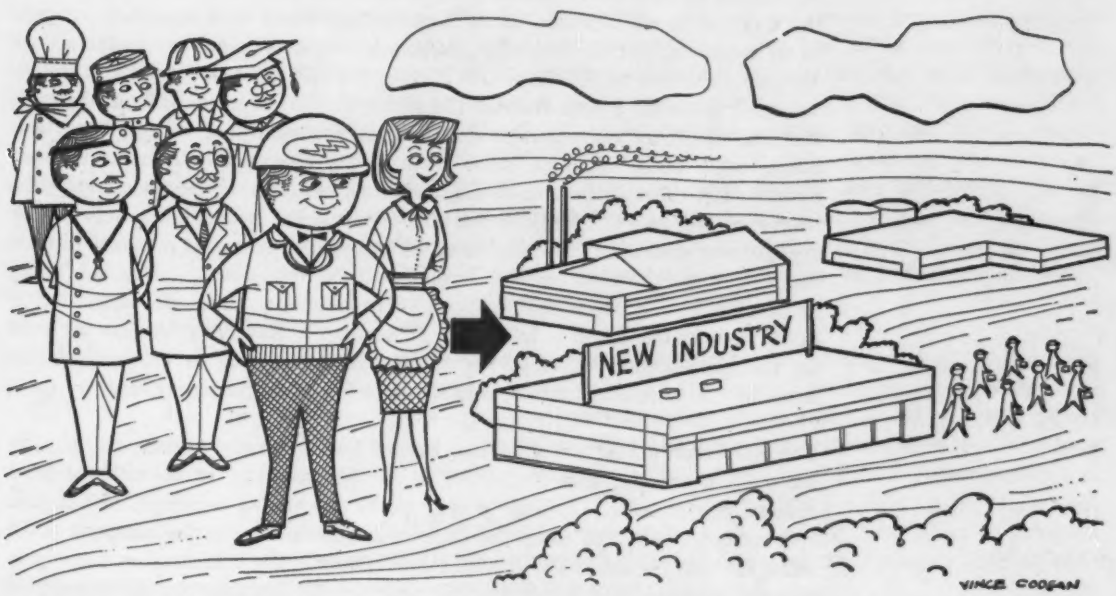
THE BEST GUIDANCE COMES FROM YOU, the power company. Tell us how a product is to be used. Tell us what you need. And just as important, tell us what you don't need. I'm confident that through cooperation and communication we can continue to develop products that do their job without overdoing it. This matter of working out acceptable product values is a mutual problem. You and I—representing the power company and Ohio Brass—are both ultimately accountable to the man who turns on the lights and makes the watt-hour meter run.

10152-H
OHIO BRASS COMPANY, MANSFIELD, OHIO
Porcelain Insulators – Line Hardware – Capacitors – Lightning Arresters Bushings – Holan Truck-Mounted Power Devices and Bodies – Bronze Valves

Electrical World

SEPTEMBER 18, 1961

Management Newsletter



Utility Builds Buildings to Build Business

"What is good for the communities we serve is good for us." This philosophy has been almost universally applied by electric utilities through the years, and in a way it is the philosophy that has led to greatly increased interest in area development on the part of electric utilities.

The concept of attracting new businesses to specific areas in order to improve economic conditions and make more business for firms already there is not new. US railroads have done it for years, and in fact are among the pioneers of the concept. Some, but not many, electric utilities have long histories of cooperative area development, but in the years since World War II nearly all have adopted all or parts of various area development programs. And in the last ten years or so, area development has become an extremely important part of electric utilities' load building and community service programs. In fact, it was just ten years ago that the growth of this type of activity led to the formation of an area development committee by Edison Electric Institute.

Nearly all of the utility area development plans have a "help the community help itself" approach, in varying degrees. In some cases the utility is just an active member of a Chamber of Commerce-type organization devoted to comprehensive city planning and zoning. On the other end of the scale, some electric utilities are actually the initiators of local area development activities. There are just

not many radically different approaches to area development being used by participating utilities, but occasionally there is some new twist that is dreamed up and tailored to fit local requirements. One of these, introduced by Appalachian Power Co in June, is called "Project Decision," and is the first one of its kind to be used by an electric utility, as far as EEI and other industry observers know. The basic approach has been used, however, by other interests, and is usually identified with real estate developers.

Fundamentally, what APCo has done is set up a $300,000 revolving fund to be used for land acquisition and to build a shell building for resale or lease to an industrial or commercial concern.

New ideas in area development quite often come from different local needs—this was true in APCo's case, too. The company, which is an operating company of the American Electric Power System, serves western Virginia and southern West Virginia. Dorman M. Miller, who is in charge of APCo's area development activities, took notice of a large number (81 in 18 months) of inquiries from commercial and industrial interests who asked about availability of buildings for their businesses. These inquiries came both to the area development department directly, and through the area development organizations of various communities served by the utility. Miller found that most of the communities were poorly organized to undertake construction of buildings, and were also reluctant to raise the money necessary for such a large speculative investment. This led Miller to develop Project Decision. APCo frankly calls it a "bold approach," but is quick to point out that it is in no way a "handout." Revolving fund money used for one project must be recovered before being reinvested in another. Miller terms it: "A gesture of leadership in the direction of self improvement."

For more than a year the details of Project Decision were worked out in strict secrecy. It was felt that the nature of the program had to be withheld from communities in order to give all of them equal opportunity to comply with certain requirements. Also, by using the surprise element available, the company could make the most of the public relations opportunity. The communities knew only that the company was conducting an exceptionally intensive survey concerning industrial development. None knew that a new industrial building might be its reward for cooperation, and the demand for cooperation was high just because of the complicated survey itself.

Step I of the survey was a questionnaire mailed to 73 communities. Composition of this and a second one took APCo people between three and four months. The first one sought to find how many communities had sites of at least ten acres, with a length-to-width ratio of about 1½ to 1. Was the land available? Was it zoned for industry? Was it served with rail siding, or was rail service feasible? What utility services were available and what capacity? These questions and others, which are thoroughly familiar to area development personnel everywhere, helped established how desirable the individual community was as a potential home for a new industry. A total of 35 communities met those basic qualifications.

Step two of implementation of Project Decision was another questionnaire sent to the 35 that covered in detail 33 parts of community business, education, recreation and social life. Appalachian wanted to know about planning, zoning, schools, teachers with degrees, hospital beds, churches, church membership, ratio of assets to loans in the leading financial institutions, numbers of policemen and firemen, quantity and quality of fire and police protective facilities, housing, libraries, tennis courts, golf courses, private clubs, youth activity groups, cultural activities, hotel-motel facilities, news media, transportation facilities, present industries, union activity, labor costs, labor supply, utility and fuel costs and availability, materials and services, and a great many other things.

Because the exact purpose of the questionnaires were not known to the communi-

ties, and because they were complicated and time-consuming, the questionnaires themselves proved to be the first tests of community (or community leadership) interest in progress. A number were eliminated from the competition by default simply because they did not fill out the forms by a specified deadline.

"This questionnaire (Step II) wasn't an easy one to fill out," Miller commented. "The Chamber of Commerce and development groups that worked on it deserve a lot of credit for their patience." And of course, they did the work without knowing of possible benefits to them.

Of the 35 communities that received the questionnaires, nine rated "excellent," and 17 rated "good." These initial ratings were derived by the APCo area development department from a mass of facts and figures that poured in and were collated into a system adaptable to scoring. Medians and norms were established and qualitative values assigned to each answer. The two APCo men charged with the responsibility of scoring the communities estimate that they made 8,500 separate calculations to arrive at the final scoring. The communities were judged against each other, and not against national averages or norms, APCo reports. To make a final decision, three impartial judges from outside the area made spot visits to the communities that survey results showed were outstanding. In the case of selecting the first community to receive a shell building, the judges confirmed in their talks with townspeople and visual observations what the APCo survey had already shown. Abingdon, Va., would be the first community to get an APCo industrial building.

Abingdon is a town of about 6,000 population that is endowed with leaders who have been greatly concerned about the exodus of its young people in recent years. The agricultural and distributive economy of the area has not provided enough jobs to hold new generations, so various community development sponsors have been trying to make it attractive to industries. Says Robert Johnson, president of the Chamber of Commerce: "Project Decision was the right answer at the right time for us. Everything we've done in recent years has been aimed at industrial development: a new high school, a new technical school, a country club, an addition to our hospital, and new public buildings."

The town is on the main northeast-south traffic line, and is served by the Norfolk & Western Railway and several motor truck lines. A new interstate highway is being built nearby.

Several industries have chosen to locate in Abingdon in the past, so a new one will find some company. Already in the town is a processing plant of Pet Milk Co, a plant of the Columbus McKinnon Chain Corp, Abingdon Manufacturing Corp (textiles), Cumbow China Decorating Co, and other smaller operations. The primary base of the economy, however, is tobacco and dairy farming, with distribution-type businesses running in second place.

Project Decision was also hailed by Dr. Scott Shaffer, president of Washington County Industrial Foundation, Inc, and William N. Neff, president of the Washington County Bank. Both referred to the young people of the area as a "resource," and expressed hope that industries would stem the flow of this resource from the area.

It was in mid-June when the months of secrecy about the exact nature of Project Decision came to an end, and APCo scored an important public relations and publicity coup. It had the element of surprise, it had the endorsement and participation of local and state dignitaries, and it received wide coverage in newspapers of the state. Among those who spoke as the announcement was made was Marvin Sutherland of Richmond, director of the State Department of Conservation and Economic Development. He commented that "Project Decision marks a milestone in the history of industrial development."

At the time of the announcement, R. E. Hodges, APCo vice president and general manager, was able to tell the citizens of Abingdon that his company would finance the construction of a $200,000 shell building and then help find an industry that would like to be located there. When the building is completed, and a tenant found, the Washington County Industrial Foundation will repay APCo its investment, and the process will start again in another community with the same money. Two prospective tenants have already expressed to the industrial foundation interest in the building.

What happens is this. The community or its development agency puts in escrow cash or promissary notes equivalent to APCo's investment. When a tenant for the building is found, the community assumes the responsibility of finishing the building and executing an agreement for the lease or sale of the building to the tenant. The community (or agency) gets its money back and returns APCo's investment.

Needless to say, after the word was out that Project Decision was a means for communities to actually get an industrial building, many of those who had not filled out the questionnaires in time were knocking at APCo's door to get in line for aid in the future. Dorman Miller explains, however, that it was absolutely essential to set a hard deadline for the survey. But the initiation of Project Decision does not mean that the company will slow its efforts to attract industries to all communities it serves. The more conventional practice of cooperating with development organizations, Chambers of Commerce, and others will continue.

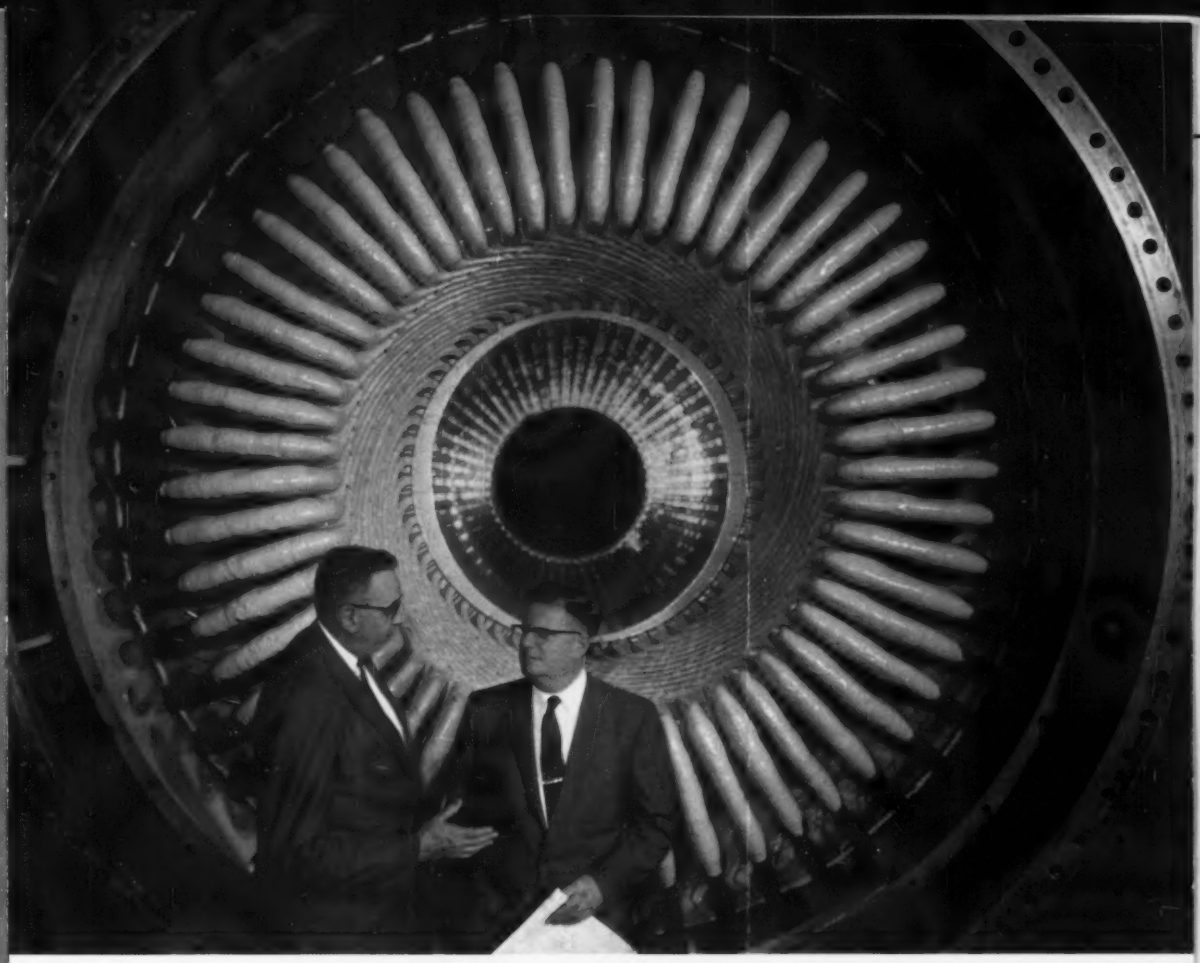
In the future, communities will be periodically re-evaluated by the APCo area development department to see what changes have been made to become more desirable locations for new industries. In fact, APCo considers this element of the program as being the most important.

The intensive survey has had the effect of making the communities more development conscious, say APCo officials, and the survey also stands as a guide to show what improvements are needed and in what areas. Project Decision actually caused "profiles" of a large number of communities to be created. These can now be used to strengthen weak spots, improve appearance and facilities, and help put them into a more competitive position to attract new industry. And qualification for an APCo-sponsored industrial building is ever-present to add incentive to making the necessary improvements. This is where the "help a community help itself" element of area development comes to the foreground in APCo's Project Decision Plan.

How will APCo help find industries for the buildings it finances? At this point Project Decision turns to more conventional practices. Regional and national advertising will be sponsored by the company, plus a wide circulation of its own publication *Development,* which carries "News about community and industrial activities in our *powerful* land." At the present time it is preparing promotional material to be sent to certain types of industries that employ 400 or more people. The hard core of the initial promotion activity, however, will be the 81 industries that have already inquired about available buildings in the APCo service areas.

When asked about the benefits to industries, Miller pointed out that acquisition of land and the details of putting up a building are time and money to industries. So, by contributing this service the company is actually giving prospective industries measurable dollars and cents of extra value.

Miller said the company, if approached directly by an industry, might give Project Decision-type assistance to it. But in no case would the company finance a "special" type building that would be useful to only one type of industry. In every case, too, even though the initial approach is made directly by an industry to the company, the local development agency of the community will be brought into the negotiations at an early stage.



General Electric generator design engineers C. H. Holley and J. A. Massingill

PRE-ENGINEERED GENERATORS FOR THE '60's

More Kva, Fewer Pounds Per Generator

From continued engineering advances in design and materials: higher ratings from physically smaller generators with high efficiency and improved cooling techniques. Some of the design features that helped achieve this progress are now history. But many are new—new because keeping power costs low in face of rising costs is a never-ending challenge. These newer developments—engineered in the late '50's—are being built into General Electric generators today.

One of these developments that has raised generator kva capacity per pound of generator is the water-cooled stator. This cooling system design has removed the stator winding thermal barrier as the primary determinant of increased kva rating per unit size. General Electric units incorporating water-cooled stators are being built and installed now—and higher-rated generators, perhaps as high as 1,000,000 kva, will be ready when needed. 244-50

GENERAL ELECTRIC

3600
with w

GE

)-rpm, conductor-cooled generator
vater-cooled stator, gap-pickup rotor

NERAL ELECTRIC

C. H. Holley points out features of liquid connections for water-cooled windings

Generators with water-cooled stator windings shatter heat barrier

Deionized water as the stator winding coolant, is economical because it allows for higher-rated units within the same or smaller frame size. Result—the inherent savings in generating larger blocks of power. Also substantial savings in plant construction.

How good a coolant is water?

- it has double the heat removability of oil, ten times that of hydrogen;
- it provides a much lower temperature rise; and
- it holds promise of achieving even further gains in generator capacity.

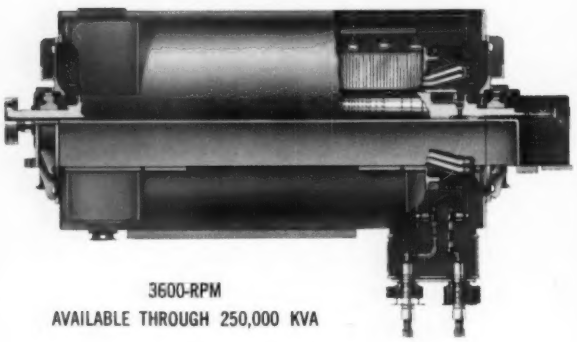
Any disadvantages? Apparently none significant, for:

- it is non-flammable;
- it can be purified with existing commercial deionizing equipment;
- it is chemically inert to insulation;
- it presents no corrosion or erosion problems; and
- it presents no arcing or flashover problems.

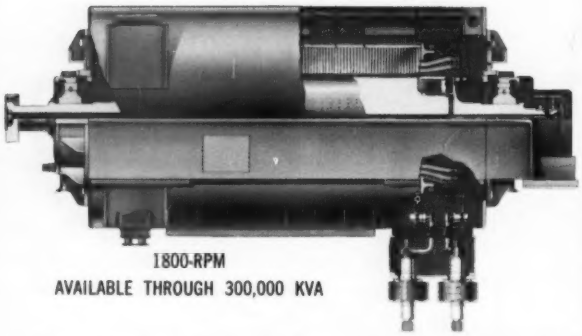
The practical application of water cooling to large generators is another example of continued engineering leadership by General Electric. For complete information on steam turbine-generators for the '60's, contact your General Electric Generation Sales Engineer.

General Electric generators for the '60's

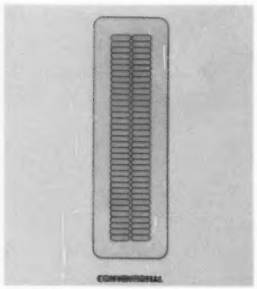
TYPICAL CONVENTIONALLY COOLED GENERATORS



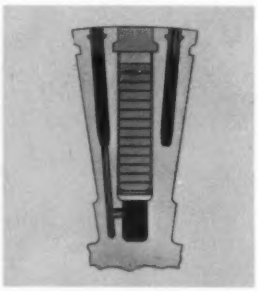
3600-RPM
AVAILABLE THROUGH 250,000 KVA



1800-RPM
AVAILABLE THROUGH 300,000 KVA

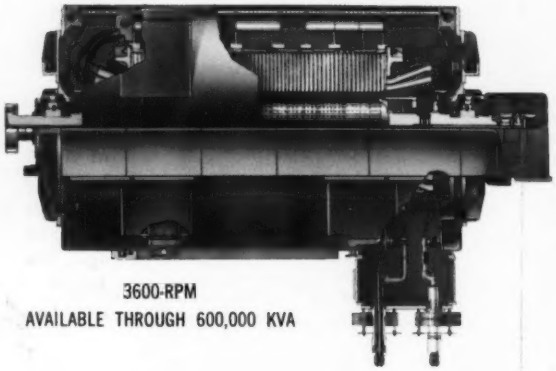


Stator Windings—cross-section of Micapal-insulated stator bar.

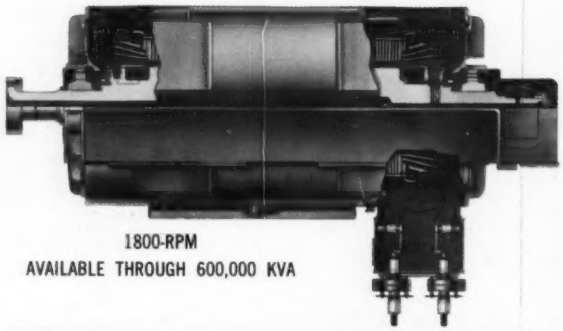


Rotor Coils—cross-section of rotor slot shows how all four sides of winding are cooled.

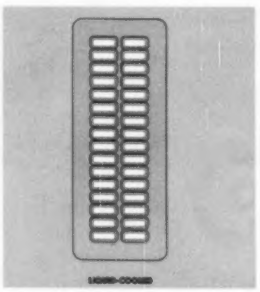
TYPICAL CONDUCTOR-COOLED GENERATORS



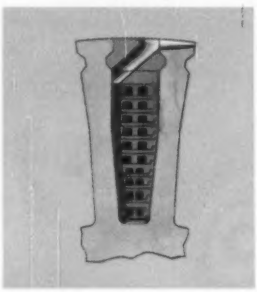
3600-RPM
AVAILABLE THROUGH 600,000 KVA



1800-RPM
AVAILABLE THROUGH 600,000 KVA



Stator Windings—hollow copper conductors permit direct contact of liquid coolant with copper for high heat removability, leaving maximum room for current-carrying copper.



Rotor Coils—gap-pickup design utilizes multiple-parallel cooling gas paths flowing through the hollow copper conductors resulting in uniform winding temperatures throughout rotor length.

Pre-engineered features to meet tomorrow's power demands, with:

- gap-pickup rotor—increases heat removal capabilities, cooling of internal coil surfaces
- improved forgings—increase reliability, provide uniform magnetic properties, smoother operation
- core design—increases efficiency and reliability, reduces generator physical size and weight
- core mounting—minimizes generator vibration, quiets operation
- non-magnetic end-structure design—increases efficiency, reactive capability at leading power factor
- Micapal insulation system—improves performance, increases reliability, lowers maintenance costs

PRINTED IN U.S.A.

Progress Is Our Most Important Product

Middle South Utilities Elects Whitmore VP

Paul G. Whitmore has been elected a vice president of Middle South Utilities, Inc. He will represent the company in matters concerned with system engineering and construction.

Whitmore served with West Penn Power Co and Ebasco Services Inc prior to joining Middle South. Assigned to Middle South System subsidiaries in 1942, he was responsible for coordinating all system planning, construction, design, operating, and similar work between these companies and Ebasco. He has been secretary of the Middle South System Operating Committee since 1945.

◀ WHITMORE

PERSONAL BRIEFS

O. J. Toulouse has become director of employee relations and safety for Sierra Pacific Power Co.

William H. Layman has been appointed assistant general manager of the Saxton Nuclear Experimental Corp.

Mark D. Stenson has joined R. W. Beck & Associates. Employed in the consulting engineering department, Stenson works with the firm's clients in the Northwest, Alaska, Midwest and Southwest.

At Mississippi Power & Light Co, **F. G. Smith** has transferred to the general office to assume responsibilities as assistant general sales manager. **C. P. Hester** became southern division manager, in McComb. **Joe H. Box** was named NEN division manager.

At Philadelphia Electric Co, **R. S. Diggs** has stepped into the post of assistant to the general superintendent. **W. L. Maruchi** was appointed engineering division superintendent, and **S. J. Steinberg** was promoted to assistant superintendent.

New assistant comptroller for Kansas Power & Light Co is **Herman F. Schuster.**

S. E. Kelly Jr has been named Bay City manager for Central Power & Light Co, succeeding **R. W. Bussell** who retired.

West Penn Power Co has boosted **Benjamin Bennett** to the post of treasurer.

At General Electric Co, **Robert A. Sestero** has been named manager of advertising and sales promotion for central air conditioners. He is responsible for advertising, sales planning, and sales promotion programs for central air conditioners, heat pumps, and furnaces.

Jean Eggert has become Home Economics Institute director for the Hotpoint division of GE. She replaced **Mrs Frances Michael Folsom** who resigned for personal reasons.

John L. Bauer has been appointed manager of study projects in GE's installation and service engineering department, with headquarters in Schenectady.

Standard Transformer Co has appointed **R. A. Keeler** as district manager of the New York office. He will be in charge of the New York, New Jersey and Connecticut areas.

New sales engineer at the Boston sales office of Riley Stoker Corp and Union Iron Works division is **John J. Geany.**

William G. Long is now manager of I-T-E Circuit Breaker Co's transformer and rectifier division, located in Philadelphia. He succeeded **Otto Jensen** who joined the corporate engineering staff.

At Worthington Corp, **Norman L. Meyerson** has been appointed experimental research director at the Harrison division. **George W. Soete** became chief engineer of centrifugal pumps for the division. **Vincent deP. Gerbereux** was named director of marketing services and **Raymond E. Young** stepped into the post of acting comptroller.

A new activity, divisional product planning and development, has been formed within the Permutit Industrial division of Pfaudler Permutit Inc. **Stanley Lenox** heads the new group.

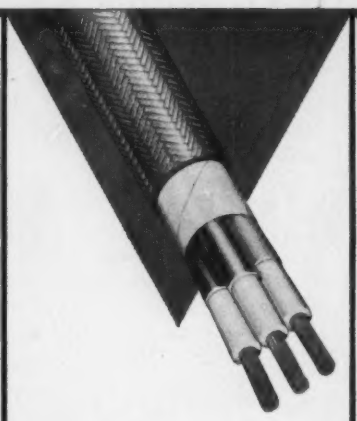
Richard P. Bloss has been appointed assistant to the manager of industrial control systems of Thompson Ramo Wooldridge Inc. **Ray J. Stanish** became general sales manager for TRW computers company division. He supervises computer sales in the US and Canada.

Rhea P. Lapsley has been chosen to direct military product sales of Okonite Co, wire-fabricating subsidiary of Kennecott Copper Corp.

OBITUARIES . . . Ralph Sargent Sr, retired partner with Sargent & Lundy and formerly a vice president with S&L when it was a corporation . . . **Chester B. Lawson,** 74, retired vice president of the Schuykill and Pottsville divisions of Pennsylvania

(*Continued on page* 162)

Rockbestos Silicone Rubber

	POWER CABLE	 CONTROL CABLE	APPLIANCE and FIXTURE WIRE
Voltage	600 and 5000 volt	600 volt	300 and 600 volt
Operating Temperature	125°C	125°C	150° and 200°C
Size Range	600V: #14 AWG to 500,000 CM 5000V: #8 AWG to 500,000 CM	#14 — #9 AWG	150°C: #22 to #18 AWG — 300 volt #22 to #10 AWG — 600 volt 200°C: #18 to #12 AWG — 600 volt
Construction	**Conductor** — Tinned copper, stranded **Insulation** — Silicone rubber **Covering** — Asbestos braid	**Conductor** — Tinned copper, stranded **Insulation** — 3/64ths silicone rubber, glass braid, color coded **Covering** — Cable tape, asbestos braid. Also available in galvanized steel, aluminum or bronze interlocked armor	**Conductor** — Tinned or nickel plated, stranded or solid **Insulation** — Silicone rubber **Covering** — Glass braid
Applications	Power wiring in high ambient temperature locations. Allows the most efficient utilization of the conductor. Satisfactory for installations in wet or dry locations.	Recommended where control or signal circuits are exposed to high ambient operating temperatures... steel mills, power stations, automotive, cement and glass plants.	For wiring of high wattage units, such as lighting fixtures, clothes dryers, sun lamps, stoves, electronic equipment, water heaters, ovens, and other apparatus.

Wire & Cable Selector

APPARATUS and MOTOR LEAD WIRE	LIGHTING WIRE
600 volt	600 volt
200°C	125°C
#20 to 4/0 AWG	#14 to #8 AWG
Conductor — Tinned copper, stranded **Insulation** — Silicone rubber **Covering** — Glass braid	**Conductor** — Solid tinned copper **Insulation** — Silicone rubber **Covering** — Glass braid
For leads to motors and transformers in high temperature locations. Stands up excellently under varnish dip and bake processes.	For lighting circuits in high ambient temperature locations.

Rockbestos Silicone rubber cables give you these outstanding advantages:

- excellent heat resistance 125°C-200°C allowable conductor temperature
- flame resistant—slowly forms non-conducting ash maintaining circuit integrity
- corona and ozone resistant
- maintains flexibility from —130°F to +500°F
- excellent resistance to oil, solvents, fuels and chemicals
- excellent electrical properties

ROCKBESTOS WIRE AND CABLE CO.
division of **CERRO CORPORATION**
Nicoll and Canner Sts., New Haven, Conn.

Gentlemen:

I would like to know more about the unique advantages of Rockbestos Silicone Rubber Wire and Cable. Please send me the following:

- ☐ The Rockbestos Silicone Wire & Cable Catalog.
- ☐ A sample of your silicone rubber wire.
- ☐ Please have distributor or salesman call.

Name_____

Company_____

Address_____

LOCATE HIDDEN DECAY AND LENGTHEN POLE LIFE

OSMOSE INSPECTORS DIG FOR THE ANSWER

Regardless of species or original treatment, every older in-place pole is a prime target for groundline decay. Records prove it. And there's no short cut to inspection. It's literally a case of digging for answers. The first 18 inches will quickly tell the story to experienced OSMOSE Inspectors.

Inspection without treatment merely observes decay as it progresses. Often enough, such methods actually encourage decay. The OSMOSE method not only locates decay, but halts and prevents it. This is the big difference between common "inspection-only" practices and the OSMOSE Inspection and Treatment method.

Hundreds of utilities know that the OSMOSE way is the only sure, safe way to keep older poles standing for many more years of trouble-free service. And the cost is remarkably low. Actual field reports show that the OSMOSE Inspection and Treatment Program can pay for itself if only 3 to 6% of your older poles can be saved from becoming "rejects". Get all the money-saving facts, write: Osmose Wood Preserving Co. of America, Inc., 991 Ellicott St., Buffalo 9, N.Y.

OSMOSE

SERVING UTILITIES SINCE 1935

(*Continued from page* 159)

Power & Light Co . . . **G. Graydon Curtis,** assistant general sales manager for Rochester Gas & Electric Corp . . . **Maurice L. Daltroff,** 67, former electrical superintendent of the maintenance division of Philadelphia Electric Co . . . **Edwin Harley Boddy,** 60, retired research engineer in General Electric Co's household-refrigeration department.

Weiss Given Promotion By New Jersey Utilities

WEISS

Dion Weiss has been appointed chief electrical engineer for Jersey Central - New Jersey Power & Light Companies. Weiss, who was assistant chief engineer for the two utilities, succeeded Charles A. Dougherty who retired. Weiss joined Jersey Central P&L in 1936.

Allis-Chalmers Appoints Lyons to Vice Presidency

T. D. Lyons has been elected vice president for administration in Allis-Chalmers Manufacturing Co's industries group.

Moloney Promotes Schiek

Moloney Electric Co has appointed William H. Schiek as manager of sales for the switchgear division. He has been associated with the metal-clad switchgear field since 1936.

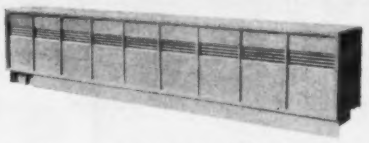
Meanwhile, George J. Boje joined the switchgear division's sales department, and D. E. Cragen was promoted to the St. Louis sales department. A. P. Samuel succeeded Cragen as advertising manager, and Charles E. Donovan was named manager of the repair and replacement service department.

MURCO GATE HOISTS

for any Size Power Dam

DESIGNED TO MEET YOUR REQUIREMENTS

MURCO Gate Hoists are designed and made for any size power dam . . . capacities from less than 1 ton to over 375 tons . . . from the smallest hand operated to the largest motor operated gate hoist, all made to specifications.



For the second largest hydroelectric power plant in the United States at Massena, New York—as part of the St. Lawrence power project—Uhl, Hall & Rich, project engineers, selected MURCO Gate Hoists to control the water level at Long Sault Dam.

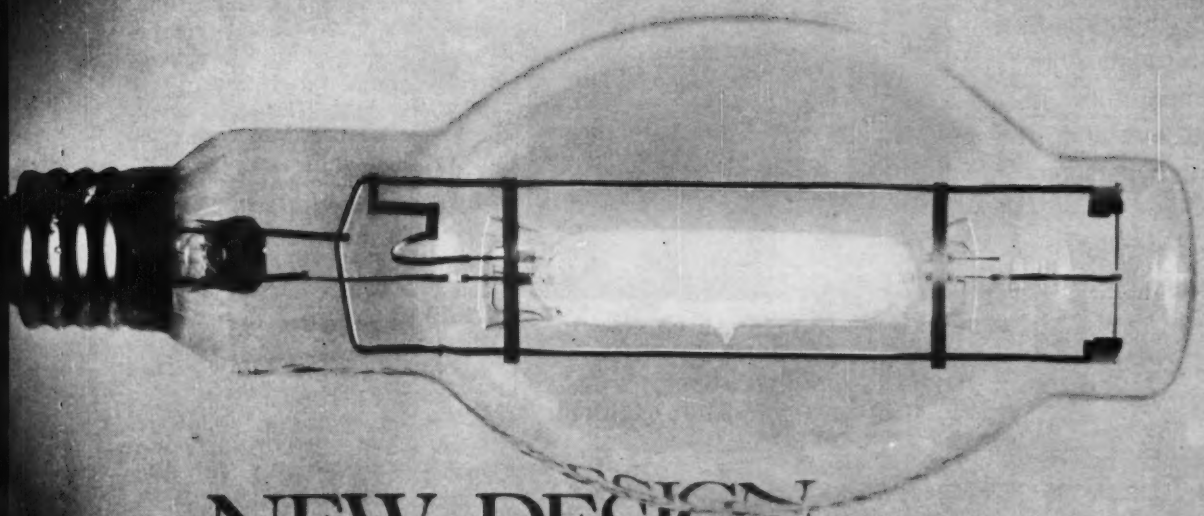
One of the two 380-ton MURCO Gate Hoists furnished to the Power Authority of the State of New York.

Each hoist operates a gate 46' wide by 67' high at one foot per minute. These gates divert the water from the Niagara River above the Falls into covered conduits five miles long. The two conduits bring the water to the Niagara Generating Plant on the United States side of the Falls.

Write for complete information . . . Engineering Department recommendations . . . when you are planning power dam projects.

D. J. MURRAY MANUFACTURING CO.
MANUFACTURERS SINCE 1883
WAUSAU • WISCONSIN

YOU'RE LIGHT YEARS AHEAD
WITH WESTINGHOUSE



NEW DESIGN GIVES 25% MORE LIGHT

NEW WESTINGHOUSE "LIFEGUARD® MERCURY LAMPS...

Give you the most light per dollar . . . because a new Westinghouse electrode virtually eliminates arc-tube blackening . . . major cause of mercury lamp deterioration! As a result, new Lifeguard lamps are rated at a full 12,000 hours economical service life, and give up to 25% more light throughout their 70% longer life.

Lifeguard lamps (available in 100 to 1000 watts) are made of Weather Duty™ hard glass for extra dependable service indoors, or out. They will not crack or craze when exposed to rain, sleet, snow, thermal shock, or corrosive industrial gases.

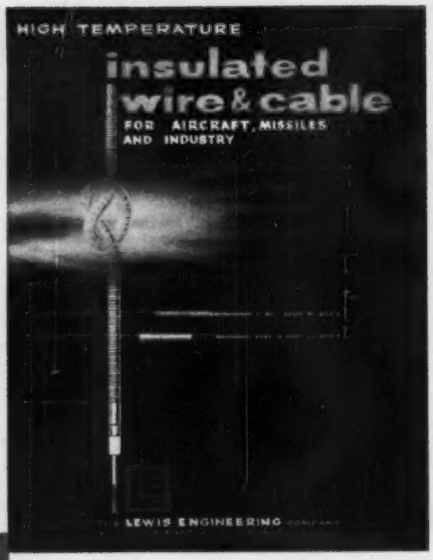
The Lifeguard lamp is just one of the many types of Westinghouse lamps designed to save you money. Take advantage of the Westinghouse Lighting Cost Reduction Plan and cut your lighting costs in one or more of the following ways: (1) Reduced cost of lamp purchases; (2) Reduced lamp replacement labor costs; (3) Increased lighting level for the same or lower power costs; (4) More efficient use of power. For complete information, call your Westinghouse Lamp Agent . . . or your nearest Westinghouse Sales Office. You can be sure . . . if it's Westinghouse.

Westinghouse

Westinghouse Lamp Division, Westinghouse Electric Corporation, Bloomfield 2, N.J.

DESIGNERS and ENGINEERS:

write for this brand new data on flexible, high temperature resistant wire and cable for hypersonic vehicles, or special industrial applications.



Here's the latest on the HOTELEC WIRE PROGRAM for continuous operation at 650°F, 850°F and 1,000°F! Write to:

THE **LEWIS ENGINEERING** COMPANY
NAUGATUCK, CONNECTICUT

Five Moderate Growth Utilities

For our current list of electric utility stocks considered interesting for growth prospects, write or call—

Dept. U

Carl M. Loeb, Rhoades & Co.

Members New York Stock Exchange, American Stock Exchange and principal Commodity Exchanges

42 WALL STREET NEW YORK 5, N. Y.

Private Wire System to Branch Offices, Correspondents and their connections in 100 cities throughout the United States and Canada.

Selling

(*Continued from page* 144)

but also to adults enrolled in their adult training classes.

Another load and revenue builder for Arkansas cooperatives has been the rental program on pole-mounted, photo-electric cell controlled mercury vapor and incandescent lights. These lights are excellent for improving load factor. The monthly rental charge varies from $3 to $3.50 per light. The rental charge covers installation, maintenance and energy cost.

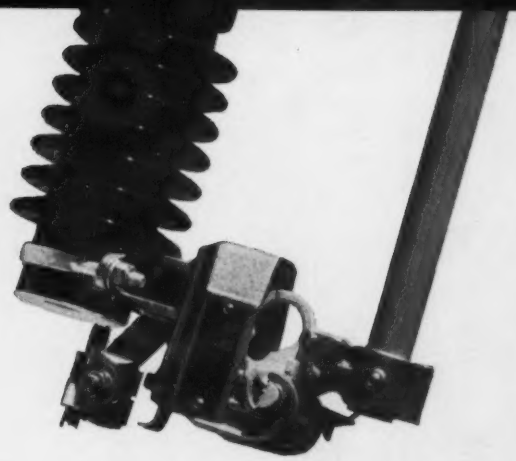
A good example of what has been done is the pole light rental program of North Arkansas Electric Cooperative. In the past ten months, this 7,000-meter cooperative has rented and installed about 700 of these lights on their lines at a monthly rental charge of $3.50 per month each.

The North Arkansas Electric program was kicked off with a two-month employee light rental sales contest. The employees were divided into two teams for the contest. The losing team was to prepare and serve the winning team dinner at an employee dinner party. From the sale of each light rental, $2 went into the fund for financing the party. The competitive spirit of the employees enabled them to sell about 400 light rentals during August and September.

North Arkansas Electric also sold over 500 electric blankets to members during the past winter, beginning in November, by direct merchandising a well-known, low-priced electric blanket with a full replacement guarantee. Paper and radio advertising and direct contacts along with low down payments and monthly payments contributed to the success of this program. Programs such as this put the load on the lines when it is most needed.

Electricity Goes to Fair

Electricity will be dramatized in an exhibit by the Washington state electric utilities at the 1962 Seattle World's Fair. A series of displays will depict the past, present and future of electrcity. One feature will show electricity's role in the 21st Century.



Here's how the F2 interrupts LOW FAULT CURRENTS

Most faults are down in the low and middle range . . . and here's where 100% dependability is really important. These excerpts from typical tests show how the F2 performs in the low range.

FAULT CURRENT* INTERRUPTED	VOLTAGE	POWER FACTOR
115	15 KV	10%
200	14.4 KV	50%
400	14.4 KV	40%
600	14.4 KV	30%
800	14.4 KV	24%

*Amperes RMS Asymmetrical

The FACTS are...You need more than High Interruption Capacity

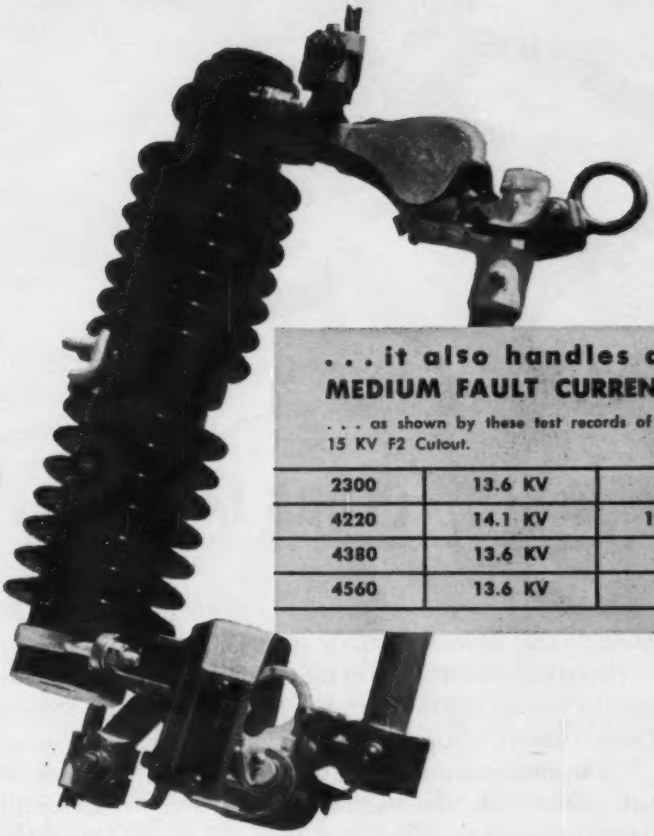
The CHANCE F2 CUTOUT Protects your system from ANY fault current...up to its maximum rating

What you really need in a cutout is overall protection . . . not just high interruption capacity, but positive performance at *all* fault currents, be they low, high, or "in-between."

The Chance F2 Cutout (already accepted and proved in service by 50% of the major utility systems in the country) gives this overall protection throughout its full rating. Gives it because: a fuse link ejector and small bore fuse tube make doubly sure that the cutout operates on low fault currents; its expendable cap, positive contact engagement, and positive latch make certain that it operates on high faults *without damage.*

The F2 Cutout is available from local stocks in voltages of 5.2, 7.8, 15 and 27 KV, and in 100 or 200 amp. ratings with interruption capacities as high as 12,000 amps. You can get the whole F2 story from your Chance salesman, or write us.

A. B. CHANCE CO.
CENTRALIA, MISSOURI
(A. B. Chance Company of Canada, Ltd., Toronto)



. . . it also handles all MEDIUM FAULT CURRENTS

. . . as shown by these test records of the 15 KV F2 Cutout.

2300	13.6 KV	7%
4220	14.1 KV	19%
4380	13.6 KV	7%
4560	13.6 KV	7%

and when HIGH FAULT CURRENTS do occur, the F2 clears them without damage.

These test excerpts show what you can expect from a 15 KV F2 Cutout in the high fault range.

8400	13.6 KV	7%
8630	14.1 KV	13%

CK61-22

PLUGS IN FOR $7.09 PER USER

Multiply that figure by 100. Or 1000. Or more.

That gives you some idea of the average yearly amount you can add to your utility revenue, with General Electric's "Open Air" Rotisserie-Broiler.

It's an appliance that can be used indoors and out, summer, fall, winter and spring. And every time it's plugged in, it uses 1500 watts.

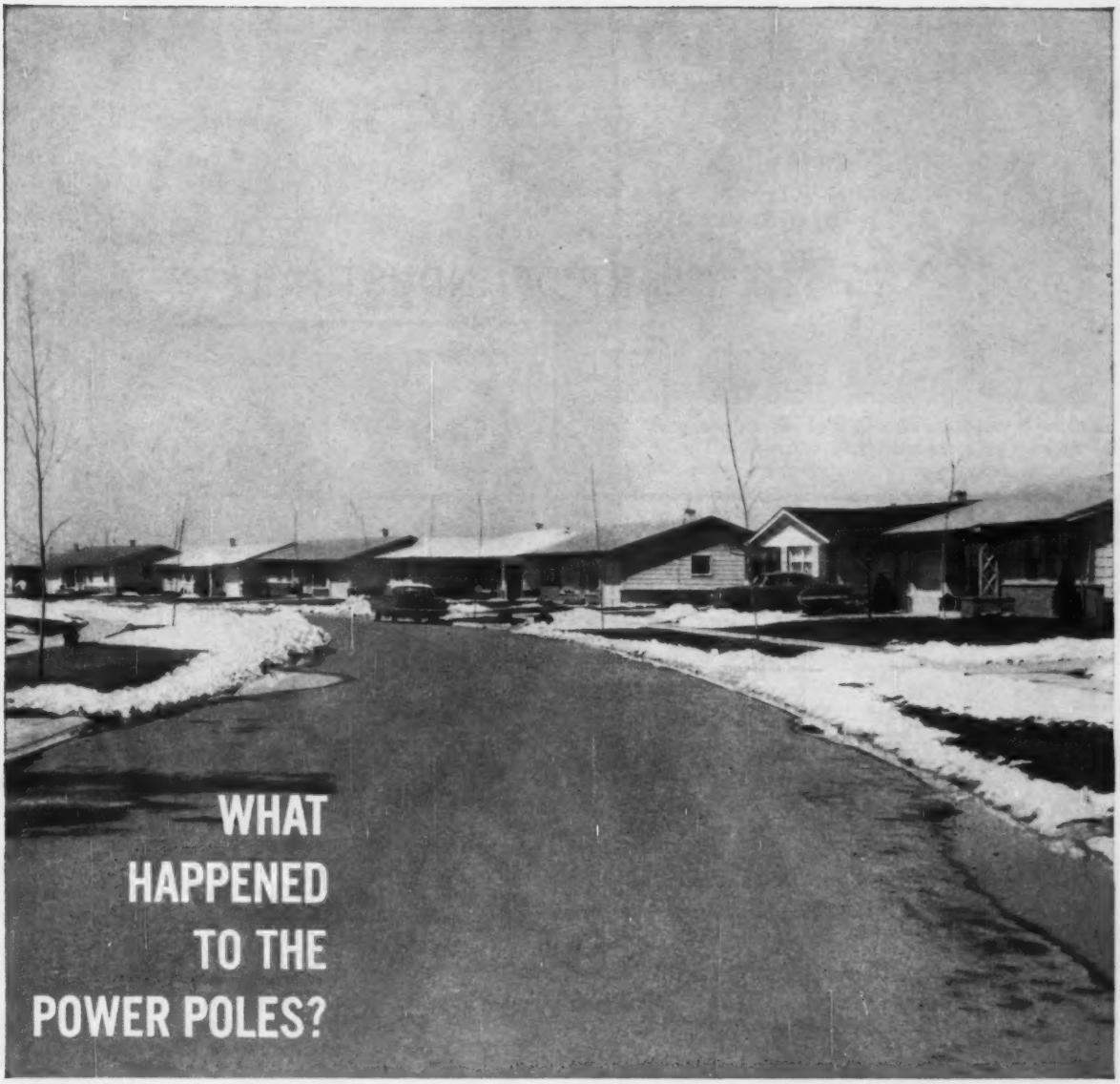
We're letting your customers know about the Rotisserie-Broiler in "Electricity on the Farm."

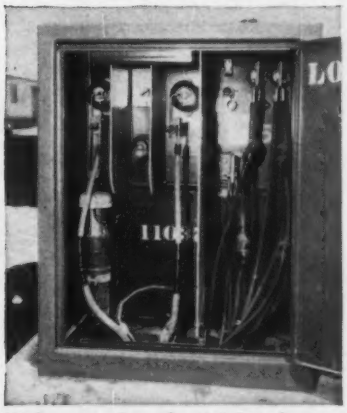
Shouldn't you be telling them, too?

For full information on General Electric programs for increasing power use, write today to General Electric Company, Portable Appliance Department, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product

GENERAL ELECTRIC





Underground residential distribution cable is terminated in this backyard transformer compartment. The cable, insulated with BAKELITE polyethylene, was made by Rome Cable Division of Alcoa, Rome, N. Y.

In Elk Grove Village, a suburb of Chicago, the developer worked out an economical arrangement with Commonwealth Edison Company to eliminate all of the power poles in this subdivision. This was accomplished by direct burial of the power distribution cable.

15-Kv cable, insulated with BAKELITE polyethylene, was used on the 7200/12470 system. It was buried directly in the ground at a depth of 36" . . . to assure trouble-free service and improve appearance.

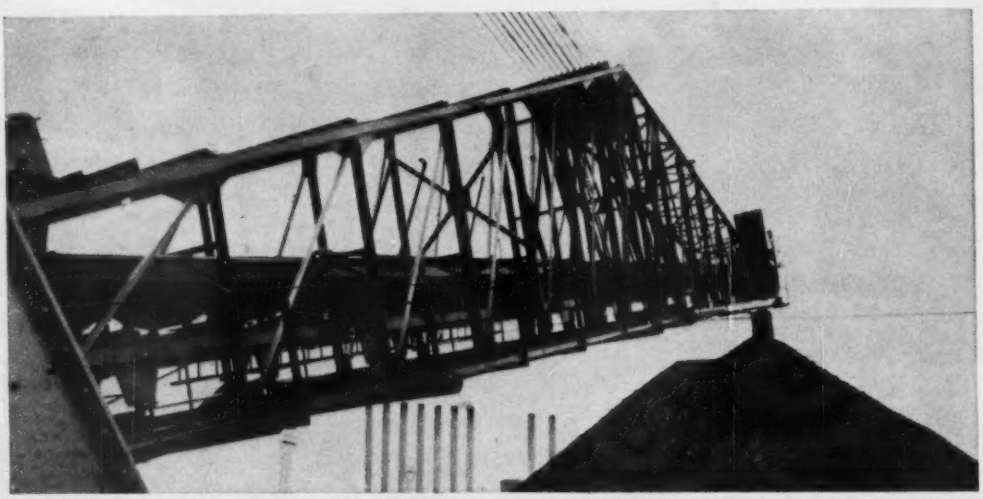
BAKELITE polyethylene insulation has proved to be a tough and dependable performer. It's highly resistant to moisture and cracking . . . an excellent low-loss dielectric above ground, or below it. Lightweight, rugged polyethylene insulated-jacketed cable can stand up to rough handling during aerial or underground installation.

Want more information about BAKELITE insulation and jacketing for more reliable electric service? Write Dept. KD-43P, Union Carbide Plastics Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada:* Union Carbide Canada Limited, Toronto 12.

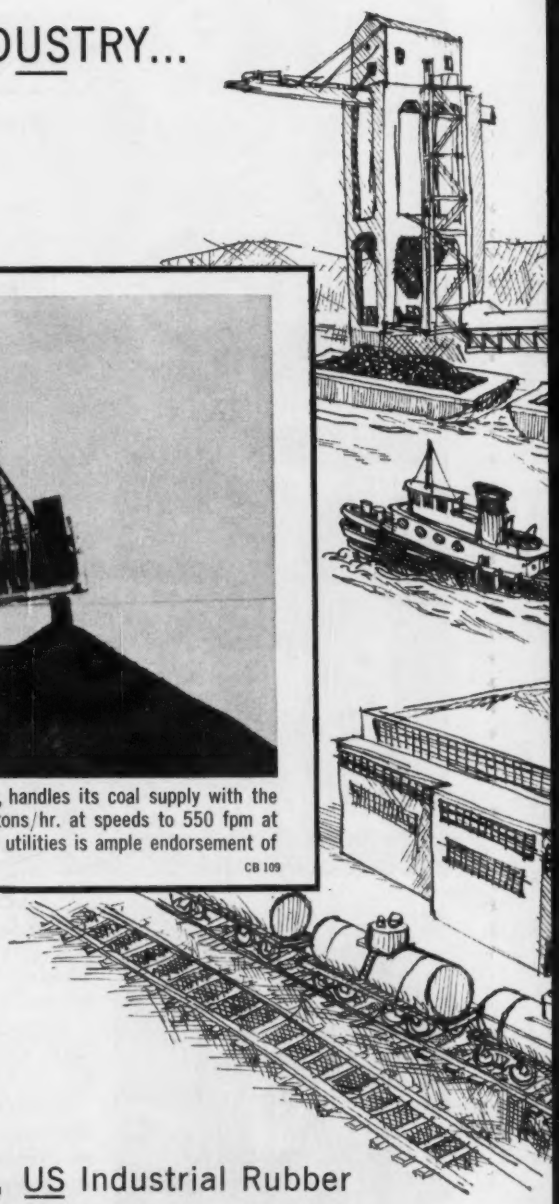
UNION CARBIDE

BAKELITE and UNION CARBIDE are registered trade marks of Union Carbide Corporation.

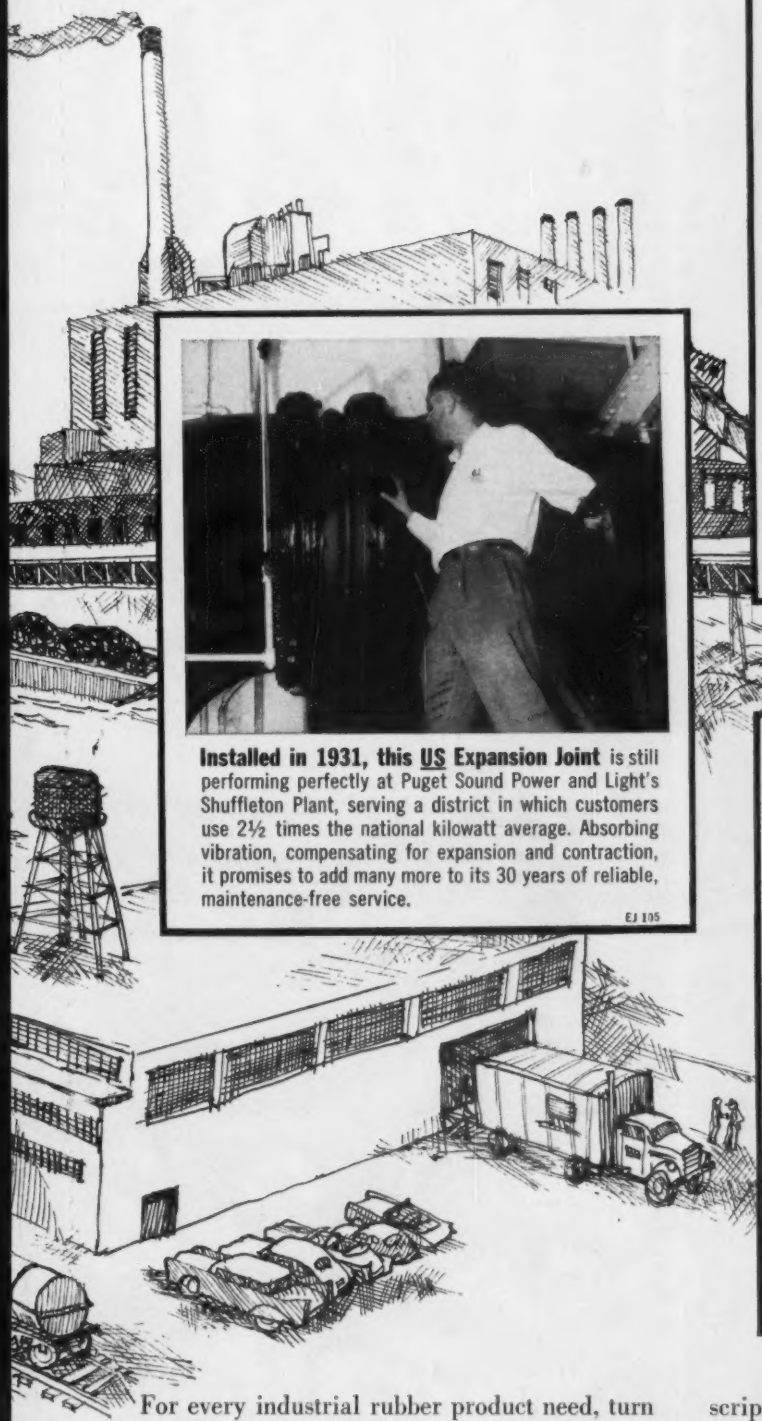
US AT THE HEART OF INDUSTRY...

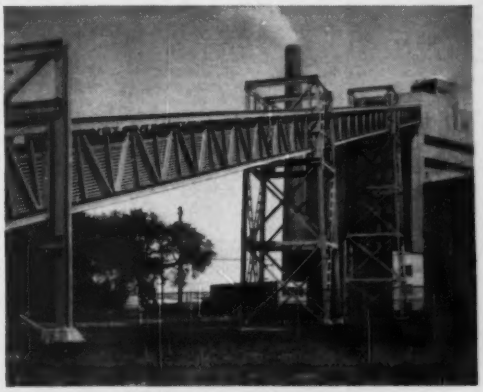


Detroit Edison fires one of the world's largest power generating stations, handles its coal supply with the aid of US Conveyor Belts. These belts move coal to storage at the rate of 2,500 tons/hr. at speeds to 550 fpm at Detroit Edison's St. Clair Power Plant. The widespread use of US Conveyor Belts by utilities is ample endorsement of their ability to provide years of service without costly breakdowns. CB 109



So important to the utilities industry, US Industrial Rubber Products keep materials flowing faster, more efficiently, more profitably. As the world's largest producer of Industrial Rubber Products, US knows and meets the needs of utilities everywhere.





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CB 130

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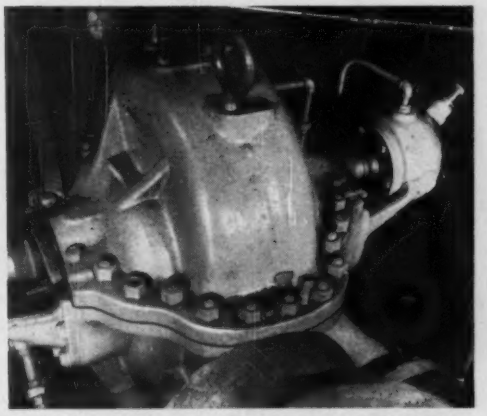
EJ 105



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P 105

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9:02

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9:20

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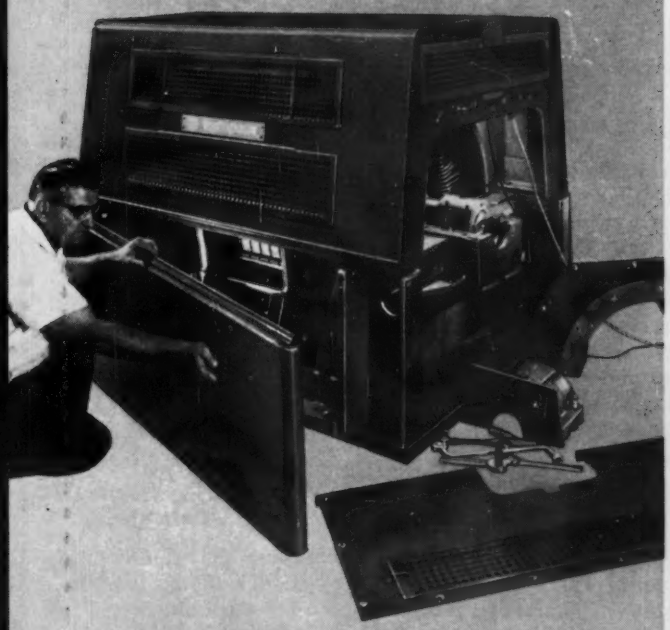
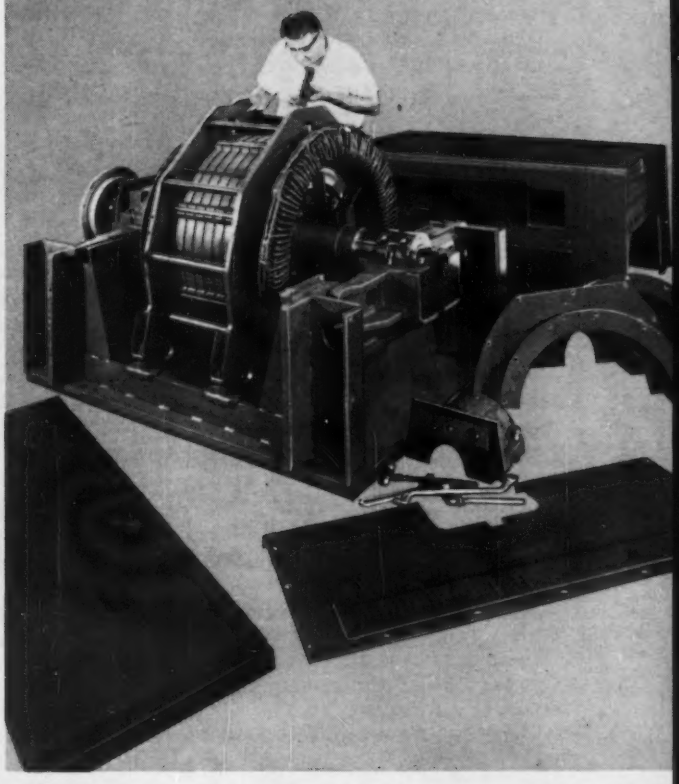
9:40

End covers, side panels, air shields removed. Winding inspection now possible.



10:32

Complete disassembly possible for major cleaning, inspection and servicing.



a Westinghouse F/A motor can be serviced in about one-fourth the normal time.

F/A motors are available in ratings from 250 hp/600 rpm to 7,000 hp/3600 rpm. For more information, call your Westinghouse Representative. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's*

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Books

Technical Set for the Technician

McGraw-Hill Encyclopedia of Science and Technology. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N.Y. 15 volumes, illustrated. Price $175.

Technical reference for the technical man might be the subtitle of this set. Its articles have been written by engineers, scientists and medical doctors in their language. The set's coverage is as broad as the title promises, as a sampling of article titles shows: *Digital computer* (15 pages), *Digitalis* (a plant), *Dimensional analysis, Dinosaur, Diode, Diorite* (a rock), *Diphenylmethane, Diphtheria, Direct-current circuit theory.*

The compilers have covered the electric field broadly. The reader could begin no better place than with the entry, *Electricity.* This two-page article attempts no more than a brief history and identification of electricity sources, but it is filled with cross-references to other articles on electricity.

One interested in electric power can approach this subject through the article, *Electric power systems,* which also is brief but further refers the reader to appropriate sections. Among them are *Electric power generation, Transmission lines* and *Electric distribution systems.* Individual articles also give bibliographies.

The entry, *Electric power substations,* for example, covers more than three pages and sets down a well-rounded exposition of what ends substations serve, what equipment they contain, and how they work. Control panels, supervisory, lightning protection and relaying come in for their fair share of description.

Indicative of the up-to-date material is the piece on magnetohydrodynamics, which is described in equation form, then described qualitatively. The equations, classified as "higher mathematics," extend into vectors, partial differential equations and tensors.

Articles on nuclear power also serve to show the timeliness of entries. The central article, *Nuclear power,* discusses advantages and disadvantages of this form of generation as well as classifying the several types. Breeding and conversion, capture cross-sections, pellets and plates, and uranium and thorium ore reserves come in for examination under *Nuclear fuels.* And radiation, nuclear structure and reactions have their separate entries. An attempt is made to present the economics of nuclear power in the article with that title, but the figures are already dated in this developing field.

If there is an objection to these volumes, it would probably lie in the language, for the articles do not condescend to the layman. *Electric power generation,* for instance, says, "Differential-current and ground relays detect failure of insulation," without first or afterward identifying a relay or the concepts of differential current and ground fault current. There is, of course, a place to go for these terms under *Electric protective devices* (though the generation article omits this reference in a rare lapse in the cross-referencing).

Contributors Prominent

The fifteenth volume contains the index and list of contributor authors. The latter comprises prominent names, including well recognized ones of the electric power industry.

Treatment of *Transmission lines* is brief but sophisticated. In three pages it handles such matters as lumped-constant representation, towers, conductors, vibration and corona in language simple enough for the non-specialist yet without resort to jarring oversimplification. Lightning and surge protection are particularly well presented. Stroke propagation is related in terms of step-leader mechanics. The place of the lightning rod, overhead ground wire, rod gap and lightning arrester in the protection of power system lines and apparatus is evaluated in realistic fashion. The roles of immediate reclosure following lightning tripout is carefully underlined. Arrester types and characteristics are enumerated and related to system application.

San Diego Joins SoCalEd on Power Reactor Project

San Diego Gas & Electric Co has accepted the invitation of Southern California Edison Co to participate in the construction and operation of SoCalEd's 375-Mw pressurized water power reactor.

San Diego says it will pay about one-fifth of the $78-million capital costs of the nuclear power plant. This is proportional to the 20% share of the power San Diego expects to get from the reactor beginning in 1965.

A definitive contract between the two utilities has yet to be worked out. Construction of the plant is also dependent on the granting of necessary authorizations and licenses by AEC and other regulatory bodies.

Meanwhile, the problem of siting the reactor at the Camp Pendleton Marine base remains. Although Defense Department officials favor that site, the Marine Corps head does not.

JCAE Chairman Chet Holifield (D-Calif.) had intended going to bat for SoCalEd before the House Armed Services Committee and would have asked the Committee to use special powers to allow the reactor's construction at Pendleton.

But the public vs private power fight over Hanford NPR apparently caused Holifield to change his mind. So the site problem remains.

When and if a site for the reactor can be arranged, major contract terms would go before Holifield's committee for review and approval.

If approval is granted, the next step would be negotiation of a final contract among the parties.

EW Editors to Speak at Electric Heating Meeting

C. F. Hochgesang, editor, *Electrical World* will deliver the final luncheon speech at the Fifth Electric Heating Conference to be held September 25-26 at the Sheraton-Park Hotel, Washington, D. C. He will detail the progress of electric heating and how the gas industry is retaliating.

John D. Damon, commercial editor, *Electrical World,* will give a report on an electric heating survey

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News Scope

TIDAL PLANT—The Soviet Union has disclosed that it has drawn up plans for an electric power station to be operated by ocean tides near Murmansk on the Barents Sea. It is scheduled for completion by 1964.

AFRICAN HYDRO — Yugoslavs are building a hydroelectric power plant in Togo, in West Africa. Two 1,200-hp turbines and associated equipment for the plant, which will be located about 200 miles north of Lome, will be made by Litostroj in Ljubljana. Generators, transformers and instruments will be made by Rade Koncar in Zagreb.

MOVING IN—Over the Labor Day weekend 19 engineering organizations moved into the new 20-story, $12-million United Engineering Center on United Nations Plaza in New York. The center thus becomes the largest concentration of professional engineering societies in the world.

FUSION INVENTION — A new type of magnetic bottle with a corkscrew field has been proposed by an MIT graduate student, Air Force Capt R. C. Wingerson. An 8-ft experimental scale model that will be charged with electrons will be built at MIT this fall. The concept combines the corkscrew effect, which is built into the model C Stellarator at Princeton, and the magnetic mirror principle, on which experiments at U. of California and Oak Ridge National Laboratories are based.

Letters (*Continued from page* 5)

the electrical power development in the United States by 1950 was so far beyond that of the early 1920's that it was believed we were on much surer ground as to the probable ultimate power system development in this country. The fact, as stated in your article, that today's planning is still in part based on our 1952 study is indication that trends suggested in the study were correct. Also, the events of the past decade have confirmed these trends. Immense power pools in this country of interconnected systems are now becoming more comprehensive, effective, and larger each year. It appears to me that, regardless of individual utility primary interests in small areas, the advantages of total national intertie and integrated power system operations to all participants are so great that we are close to total interconnected national operation.

This subject is so important and so interesting generally to the power industry that a book could well be written on it. However, my purpose in writing to you is to call to your attention an obvious error in reporting that the Bureau Study of 1952 was "unreleased."

William L. Newmeyer
Bureau of Reclamation, retired
1235 Grant St
Denver 3, Colo.

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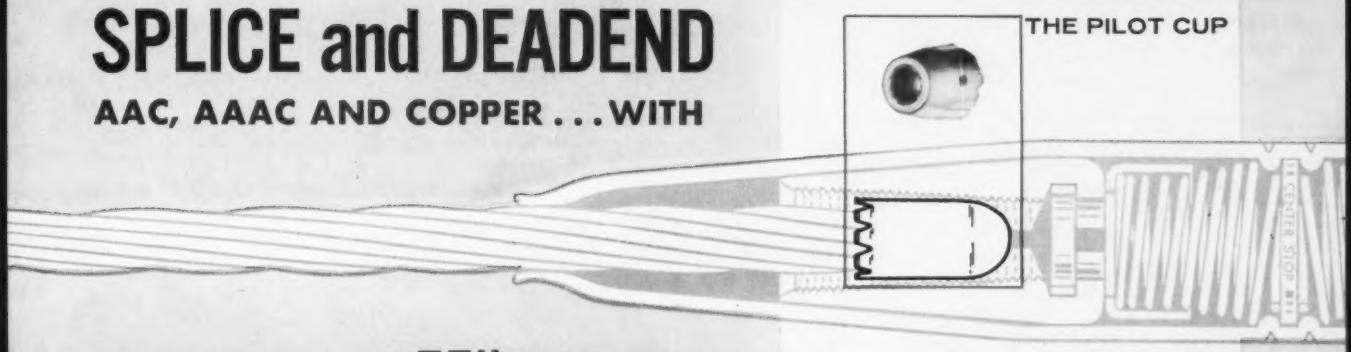

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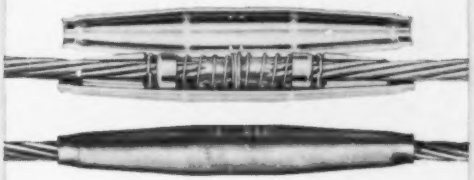

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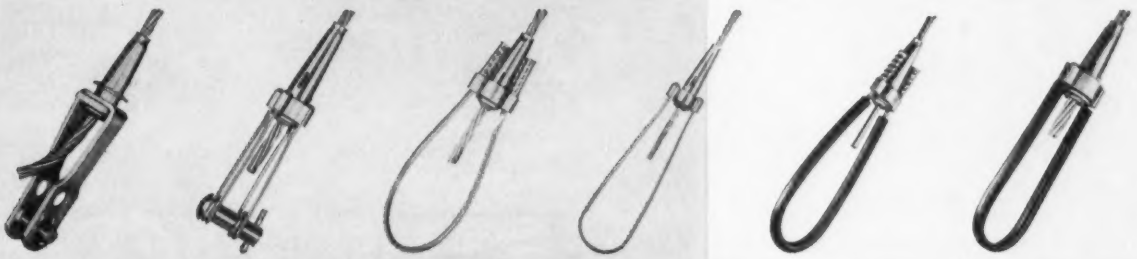

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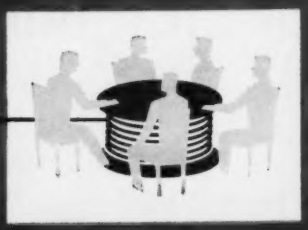

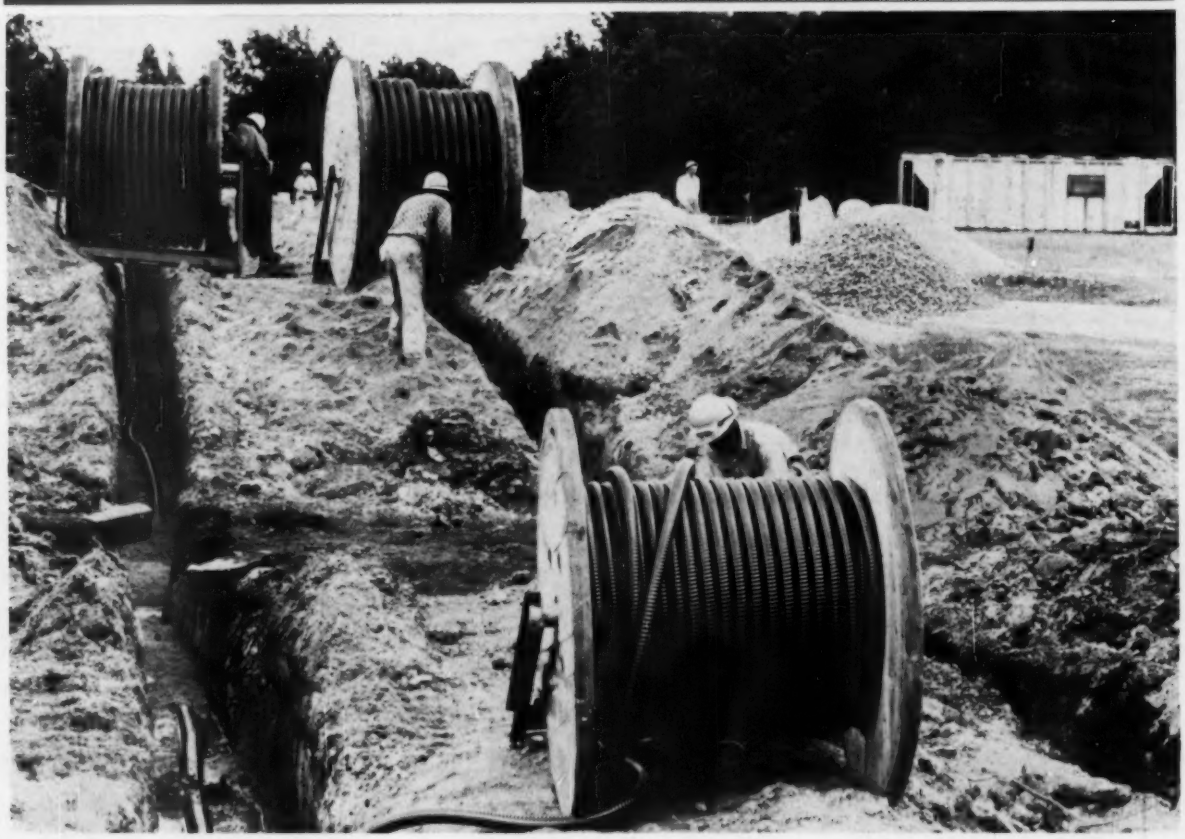

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